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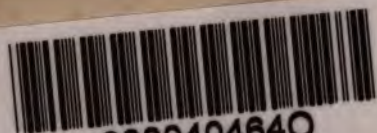
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1. The first part of the document is a list of names and addresses of the members of the committee.





PATENTS FOR INVENTIONS.

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ABRIDGMENTS

OF

Specifications

RELATING TO

METALLIC PIPES AND TUBES.

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A.D. 1741-1866.

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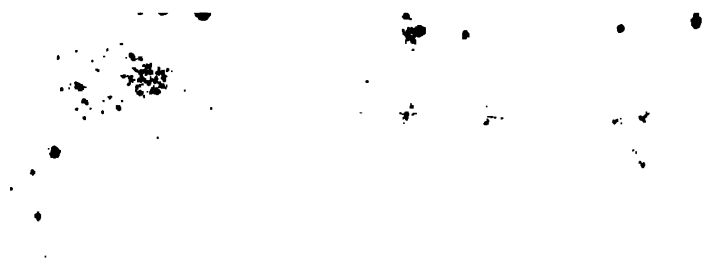
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## P R E F A C E.

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THE Indexes to Patents are now so numerous and costly as to render their purchase inconvenient to a large number of inventors and others, to whom they have become indispensable.

To obviate this difficulty, short abstracts or abridgments of the Specifications of Patents under each head of invention have been prepared for publication separately, and so arranged as to form at once a Chronological, Alphabetical, Subject-matter, and Reference Index to the class to which they relate. As these publications do not supersede the necessity for consulting the Specifications, the prices at which the printed copies of the latter are sold have been added.

The number of Specifications from the earliest period to the end of the year 1866 amounts to 59,222. A large proportion of the Specifications enrolled under the old law, previous to 1852, embrace several distinct inventions, and many of those filed under the new law of 1852 indicate various applications of the single invention to which the Patent is limited. Considering, therefore, the large number of inventions and applications of inventions to be separately dealt with, it cannot be doubted that several properly belonging to the group which forms the subject of this volume have been overlooked. In the progress of the whole work such omissions will, from time to time, become apparent, and be supplied in future editions.

This volume contains Abridgments of Specifications to the end of the year 1866. From that date the Abridgments will be found in chronological order in the "Chronological

## PREFACE.

and Descriptive Index" (*see* List of Works at the end of this book). It is intended, however, to publish these Abridgments in classes as soon as the Abridgments of all the Specifications from the earliest period to the end of 1866 have appeared in a classified form. Until that takes place, the reader (by the aid of the Subject-matter Index for each year) can continue his examination of the Abridgments relating to the subject of his search in the Chronological and Descriptive Index.

The present series of Abridgments contains the inventions relating to the manufacture of metallic pipes and tubes and metallic joints for the same, but not the application of such pipes and tubes; for instance, it includes the manufacture of tubes for the posts of metallic bedsteads, but not the method or means of forming them into bed-posts. It embraces the various operations of casting, rolling, drawing, welding, and otherwise making the pipes and tubes; alterations in the shape; modes of ornamenting, lining and coating with metal or other material; new combinations of metals for forming tubes; manufacturing tubes of sheet metal, of coiled bands, of wire gauze, &c.; also couplings, unions, and other joints for metallic pipes, but not joints for hose pipes which will be found in a forthcoming volume relating to Fire Engines and apparatus for extinguishing Fire. Pipes for wind musical instruments are excluded, and will be found in the series entitled "Music and Musical Instruments." The inventions relating to gun barrels are published in the series entitled "Fire-arms and other Weapons," &c., and only those are included in this volume which are stated to be applicable also to the manufacture of metallic tubes generally, or upon which a subsequent invention for making pipes or tubes has been founded.

October, 1874.

B. WOODCROFT.

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## METALLIC PIPES AND TUBES.

A.D. 1758, April 21.—N° 723.

WILKINSON, ISAAC.—This invention relating to the preparation and manner of forming the moulds and cores applicable to the casting of tubular and other metallic articles is described by the inventor as follows :—"The outside or cope of the mould or  
" moulds in which the guns, or cannon, fire engines, cylinders,  
" pipes, and sugar rolls, or such like instruments, or any of them  
" is or are intended to be cast must be made of sand, mixt with  
" a little horse or cow dung or any other thing to make it porous.  
" This sand is made wett and then rammed up, the patern, being  
" first put in iron boxes made for that purpose, of two, three, four,  
" five, or any number of parts or pieces, as the nature of the  
" instrument to be cast requires; then the boxes are to be taken  
" asunder into pieces and the patern taken out; then the sand  
" in the boxes is dried in a stove, and when dry it must be  
" blacked or faced with some wett charcoal dust, or black lead,  
" or any other mixture or thing to make the sand come of or  
" part from the metal when cast. The insides or cords of all the  
" different instruments above-mentioned are made with iron bars,  
" either hollow and full of holes, or solid and traced or fluted,  
" and if the bore is large it may be made of bricks walled, and  
" the bars of iron or bricks are to be wrapped round with ropes  
" made of straw or hay, to take the air of, and must be then  
" covered with a proper thickness of the said sand, and then  
" dried and blacked, as before directed; and then the moulds are  
" put together, and the instruments cast, and bored, and turned  
" as required."

[Printed, 4d. No Drawings. See Rolls Chapel Reports, 6th Report, p. 129.]

A.D. 1782, January 14.—N° 1316.

MARTIN, JOSHUA LOVER.—This invention relates to a method of drawing copper or other tubes, plated or otherwise coated with silver or gold and adapted to the construction of telescopes and other optical, mathematical, and philosophical instruments, the object being to prevent the plated surface of such tubes from



becoming scratched or otherwise damaged by the process, which is described as follows :—

“ The copper or metals to be plated is first covered with silver or gold, and afterwards formed into tubes and soldered. They are then applied to the drawbench, and, being first put on a triblet or mandril are drawn through the holes of different sizes according to the required thickness of the tubes. This being done, they are made into telescopes, perspectives, opera-glasses, or other optical, mathematical, or philosophical instruments, where plated tubes may be required. And to prevent the surface of the plated metal tubes, in the necessary action of sliding, from being scratched or otherwise defaced (which would be the consequence of tubes sliding in metal) the collars or springs thro’ which the plated tubes are made to slide is lined with cloth, velvet, or other soft substance.”

[Printed, 4*l*. No Drawings.]

A.D. 1790, March 13.—N<sup>o</sup> 1735.

WILKINSON, JOHN.—This invention is described as a “ new method of making lead pipes in a better manner than has been heretofore used.” The lead is first cast into the form of short tubular ingots, and being placed upon a mandril, the ingot is extended lengthwise and reduced in diameter by a succession of passes either between grooved rollers or through collars or dies until it obtains the length and thickness required; the inventor says: “ I cast the lead in lengths, as is practised in the common way, this is put upon a polished rod or round maundrell of iron or any other metal, such maundrells being made of different lengths and diameters, according to the size that is wanted. This rod or maundrell, with the cast lead upon it, is put repeatedly through or between rollers with grooves of different sizes, according to the external diameter required, and extended to the length or thickness ordered, or drawn through metal gauges or collars of different dimensions upon said maundrell, each succeeding collar being less than the former, until the same is extended to the length and thickness required. The maundrell is then drawn out, leaving a pipe of equal diameter within and without, and of equal strength and thickness, according to the uses required, all which may be performed with a common water-wheel, or any other rotative motion.”

[Printed, 4*l*. No Drawings. See Repertory of Arts, vol. 16, p. 92; Mechanics' Magazine, vol. 33, p. 386; Engineers' and Mechanics' Encyclopædia, vol. 2, p. 55.]

A.D. 1791, May 11.—N° 1805.

WYATT, CHARLES.—This invention consists in making pipes, spouts, troughs, and cistern heads, out of sheets or plates of metal known as tinned copper sheets, being sheets of copper covered with tin, or with a compound metal such as tin combined with lead.

“ The pipes are to be formed and manufactured in the same manner and by the same methods as copper pipes formed out of sheets or plates are now usually made; and in order to form and manufacture the said pipes expeditiously, the sheets or plates of the covered and combined metal, herein-before specified under the name of tinned copper sheets, must first be cut of proper form and dimensions, and then turned or formed upon a maundrill or other instrument of the shape and size required, until the edges meet, so as to admit of being joined together, either by folding, soldering, or rivetting. The troughs, spouts, and cistern heads are made and composed of the same sheets or plates of covered and combined metal, called as aforesaid, tinned copper sheets, and are first to be cut of proper form and dimensions, and then worked and joined together, in the same manner and by the same methods as are used and practised in working and joining together copper sheets for the same purposes, until they are brought into the shape and size required; but the material part of the invention is the application of the aforesaid metal, called tin copper sheets, to the purposes herein-before described.”

[Printed, 4d. No Drawings.]

A.D. 1793, April 23.—N° 1951.

BENTHAM, SAMUEL.—This invention is manifold in its objects and relates to various mechanical productive processes, including the formation of pipes, tubes, gun and pistol barrels, cannon and hollow cylinders, by laminating thin boards, veneers, or shavings of wood, ribbons of sheet metal or other material; also sawing machines constructed to act with reciprocating motion and respectively applicable to operate on wood and stone, referring as regards the former material, to plain cuts, cross cuts, cutting in curves, circles, ellipses, bevells, &c.; also what is termed “a reciprocal lathe” which operates after the manner of a modern shaping machine, giving curvature by bending, forming wood screws, bending ships’ timbers, working by and forming rotating cutters and saws, boring either hollow or annularly, mortising,

turning, adjusting, steadying, fixing, chucking, and general modes of operating.

As regards the formation of tubes, pipes, and cylindrical articles, the thin veneers or shavings are wound either spirally or otherwise, round a mandril which, when afterwards withdrawn determines the bore or internal capacity of the pipe or cylinder, each succeeding lap or lamina of the material being attached to the preceding one by means of glue or other suitable cement or substance. The grain of the wood may either run round the tube, lengthwise, or spirally, according to the direction of the strain to which the tubes when in use are likely to be subjected, and when a tube is produced of the required strength and thickness, and then operated upon by compression, it is placed in "swedges" or suitable moulds. Ribbons of iron or other metal are also treated and worked in the same manner to form metal tubes, gun and pistol barrels, cannon, etc., the laminae of material instead of being, as in the case of wood, glued or cemented together, to be afterwards heated in a reverberatory or other furnace to the proper temperature, and welded either by percussion or other pressure; soldering or brazing may be also applied. The mandrils are either made solid and forced from the finished tubes, or of such material or substances as will melt at a low temperature and run out, or can be easily disintegrated.

[Printed, 10d. No Drawings. Repertory of Arts, vol. 10, pp. 221, 293, and 307; vol. 13 (*enlarged series*), p. 395.]

A.D. 1804, January 26.—N° 2749.

ALDERSON, GEORGE.—This invention relates to the manufacture by casting and drawing, of soft metal pipes, such as lead lined with another kind of soft metal, such as tin, or vice versa; These pipes of the combined metals are cast in short lengths which are afterwards elongated and reduced by a process of drawing through drawplates or dies. The pipes are cast in vertical moulds made in two longitudinal parts, either of wood or iron, the core bar employed to form the internal cavity or bore, being a polished rod of iron, capable of removal from the mould after the external or main section, say the lead pipe, is cast and the metal set, for which purpose the bar at its upper end is furnished with a hook or ring. When drawn out it is replaced by another core bar, so much smaller in diameter than the first, that an annular or cylindrical space is formed between the interior of the newly cast lead pipe and the second core bar, into which is first inserted



some powdered resin, which soon melts and runs down the space to the bottom of the mould. The tin or metal, which is to form the lining of the leaden pipe is then poured into the space; it runs to the bottom of the mould, and as the space fills the melted resin floating on its surface rises, and acting as a flux, causes the two metals to unite. After the process the second core bar is drawn out, and the double or combined pipe is subjected to the ordinary process of drawing. The arrangements and process may be modified by casting the tin or lining upon a core bar in a small mould, and then removing the bar with the tin on it to a larger mould, where the resin being applied the lead is cast round it.

[Printed, 4d. No Drawings. See Repertory of Arts, vol. 5 (*second series*), p. 413; Rolls Chapel Reports, 6th Report, p. 153.]

A.D. 1805, May 18.—N<sup>o</sup> 2849.

HOBSON, CHARLES, SYLVESTER, CHARLES, and MOORHOUSE, JOHN.—This invention relates to a mode of preparing sheets of zinc adapted for sheathing ships, covering roofs, and lining water spouts. The metal, cast in ingots or pieces of any convenient size or form is, in a heated state, to be rolled between rollers, and thereby brought into the form of plates of the required thickness. The metal plates by the rolling process being rendered very hard and difficult to work, then require annealing in a furnace which imparts to them the flexibility and tenacity required for easy working. The nails employed to fasten these plates when used for sheathing or roofing are to be of iron, or iron coated with zinc or galvanized, copper nails are always to be avoided on account of the galvanic action that would be set up by their presence in contact with the zinc. Water spouts are to be lined with sheet metal prepared in the same manner, the joints are when needful, to be made by soldering.

[Printed, 4d. No Drawings. Repertory of Arts, vol. 9 (*second series*), p. 251; Rolls Chapel Reports, 7th Report, p. 190.]

A.D. 1808, April 30.—N<sup>o</sup> 3127.

BELL, WILLIAM.—This invention relates to the inclosing in pipes or cases of iron or of wood, pipes or tubes of porcelain pottery, for the purpose of protecting them, and "to prevent breaking or bursting." These porcelain tubes are designed for the conveyance of water in preference to wood, which, the inventor states, is liable to decay and become rotten, generating insects

and noxious animalculæ, and that pipes of metal, without the lining of a porcelain pipe, corrode and impregnate the water, rendering it unwholesome and poisonous, and unfit for domestic purposes. Each tube is made with a socket at one end, to receive the plain end of another, leakage being prevented by the introduction of cement. Cast-iron pipes for the casings are preferred and recommended. The inventor states, "there are compound metals which are less corrosive than the real metals, as aforesaid, of which tubes may be made, and, if inclosed in the manner before described, would be useful in conducting water and various liquids, either hot or cold, for particular purposes, as also thin tubes made of wood, which may be prepared for durability by boiling it, or burning or charring it, which has the effect of preventing its breeding or harbouring insects, &c.

[Printed, *Ad.* No Drawings. See Repertory of Arts, vol. 14 (*second series*), p. 31; Rolls Chapel Reports, 7th Report, p. 201.]

A.D. 1809, July 26.—N° 3249.

HEAPS, RICHARD.—This invention, relating to the manufacture of soft metal pipes, is described by the inventor as follows:—

"After the manner of moulds now used for the purpose of casting lead pipe, I do construct moulds of brass, iron, or other suitable materials to the size and shape of the pipe, or whatever other article I design to cast or form, with one or more apertures in the sides or bottom of each mould, and through which the mould is filled by being immersed as far as is necessary in the metal, which is designed to be cast or formed when the mould is filled to the height required. The aperture or apertures are then closed by a wedge valve, or in any other convenient way, and the mould set aside till sufficiently cool to take out the article cast or formed. By this method the mould is filled from beneath the surface of the metal, and will of course be pure and free from scoria, which is ever formed on the surface of those metals while in a state of fusion, and exposed to the atmosphere. Although I give preference to the method as above described, yet the same results may be obtained by immersing the moulds till the metal runs in over the top, or by filling them either while partially immersed or immediately upon being removed from that state, which may be done in various ways, but this is not so certain of success as the former. The moulds may also be filled in some instances without immersion by or through the medium of a channel or channels

“ of communication, either to the aperture or apertures, as above described, or down what is usually denominated the core, and is that part of the mould which forms the inside or hollow of the pipe or other article cast or formed; this method is both more tedious and uncertain of success than either of the former.”

[Printed, *4d.* No Drawings. See Rolls Chapel Reports, 7th Report, p. 204.]

A.D. 1812, August 3.—N° 3590.

OSBORN, HENRY.—This invention relates to a machine designed for the operation of bending and levelling the skelps used for the manufacture of gun barrels, and other purposes, preparatory to welding the seam. The process (it is stated) “ renders the skelps perfectly straight and smooth] from end to end, and does not disturb the grain of the iron, as is usually the case with skelps turned in the common way with the panes of sledge hammers.”

The machine operates by means of a series of top and bottom swages arranged in pairs side by side; the top swage of each pair has the form of a sector, and all the top swages are mounted on a horizontal shaft, the ends whereof find bearings in the pendent arms of what is termed a cast-iron saddle. The lower swages are straight, and severally rest side by side directly beneath their companion top swages on a horizontal bed, and the several pairs act in succession upon the heated skelp by a kind of rocking or rolling motion. The skelps, which are prepared in the usual way, are, instead of having only a portion of their length heated at a time in a welding or smith's fire, placed in a reverberatory furnace, and when heated from end to end throughout, they are taken separately and presented to the first pair of swages, which as a skelp is passed between them, impart to it a hollow form throughout its whole length; thence it is taken and passed between the second pair, which have the effect of making the hollow deeper by gathering or bending up the sides: the skelp is next passed between the third pair of swages, the operating surfaces of which have the form of a portion of a circle, and they give to the skelp the required tubular form, closing the two edges from end to end in readiness for the welding process.

A mode of adapting the operations of the machine to mill power is exhibited on the drawing.

[Printed, *6d.* Drawing.]



A.D. 1812, November 28.—N° 3617.

OSBORN, HENRY.—This invention relates to the making of gun and pistol barrels, cylinders, and tubes of iron or steel. Two separate apparatus are described, consisting:—

1st. Of a tilt or helve, having about its midlength a transverse axis or fulcrum, which rests in suitable standard frames. The back end of the helve is actuated by a wheel furnished with a series of tappets, which project from its periphery, and severally strike down the end of the helve as the wheel revolves. To the free or hammer end of the helve is fixed a block or swage, which is grooved across its face to correspond with a similar set of grooves formed in the block or part that is fitted on the anvil and when the two blocks are brought together the grooves form a series of tubular holes, successively increasing in size. A “turned patent skelp” or cylindrical article is taken at a welding heat from the fire upon a mandril, and presented to the grooves respectively in the anvil block and hammer, and by the action of the latter the seam is welded, and the tube is gradually reduced to the desired size.

2nd. This machine operates by means of a series of grooved segments, which are mounted, relatively equidistant, on a heavy roller or shaft, and co-operate with a corresponding number of straight grooves respectively formed, one in each of a series of bed blocks, horizontally placed side by side on a suitable foundation. The part which carries the ends of the axes of the roller moves horizontally in the direction of the length of the bed blocks, and the segments act with a rocking motion upon the heated skelps, which are welded by the pressure when placed in the grooves, and gradually reduced to the required size.

[Printed, 6d. Drawing. See Rolls Chapel Reports, 8th Report, p. 97.]

A.D. 1813, October 15.—N° 3740.

OSBORN, HENRY.—This invention relates to the manufacture of gun barrels, cylinders, bars, and articles, which are rounded and tapered by a process of rolling. The apparatus employed for this purpose consists of a pair of metallic rollers, on each of which, relatively equidistant, are fixed or formed three or more projecting flanged rings or collars. These two rollers are horizontally mounted, one above the other in suitable side frames, the coupling bearings of the top roller being arranged for setting or pressing down, so as to regulate the distance between the rollers by means of



screws. The collars have projecting flanges, and come together in pairs, those of the top roller fitting between the flanges of the bottom roller, for which purpose the collars of the latter are made wider; by this means any motion in the direction of the length of the rollers is avoided. Centrally between their flanges each collar has formed on its periphery a hollow groove, gradually varying in depth and breadth throughout its length round the roller, so that when a gun barrel or bar, taken from a furnace at a proper heat, is passed between the rollers, in the grooves of either pair of collars which are of the requisite size, it is gradually drawn out and tapered from end to end. The same effect may be produced (as shown in the drawing) by arranging the grooved surfaces of the collars, eccentric to the axes of the rollers.

[Printed, *6d.* Drawing. See Repertory of Arts, vol 25 (*second series*), p. 11; Rolls Chapel Reports, 8th Report, p. 98.]

A.D. 1814, March 23.—N<sup>o</sup> 3793.

NOBLE, WILLIAM ALFRED.—The object of this invention, which relates to a fire engine, steam engine, and a mode of connecting hose and other pipes, consists, as regards the fire engine, in so arranging the valves that access may be had to them without dismantling the engine, and in substituting for pistons "spiral" "worms," or cylinders adapted to lift or force water."

Condensing without or with a very small air pump, a vacuum being formed in a vertical pipe reaching from 30 to 40 feet above the level of a drain or river. A more particular description of the above parts of the invention is given in the series of Abridgments relating to the Steam Engine.

Hose and other pipes are connected by means of a union or, as it is termed, a screw joint, which consists of two parts fixed respectively, one on the end of each of the two pipes which are to be united. One part consists of a socket, near the end of which, projecting inside, are two segmental pieces, the backs whereof have inclining surfaces; the other part is flanged externally, portions of which flange are cut away, in order when it is introduced into the socket it may pass the two projections, the back of the remaining parts of the flange having also inclining surfaces. When the flanged part is introduced into the socket and turned round, the inclining surfaces of the projections engage with the inclining surfaces of the flange, and by this means the two parts of the union are drawn together.

[Printed, *6d.* Drawing. See Rolls Chapel Reports, 7th Report, p. 115.]

A.D. 1817, March 1.—N° 4105.

OSBORN, HENRY.—This invention, relating to the manufacture of gun barrels and other metallic tubes, consists in making such tubes either out of flat plates of iron or steel bent into the cylindrical form, and afterwards uniting the two edges by welding, or they are made out of strings or strips of metal closely coiled or twisted round a mandril, and after being heated to a welding heat, they are passed through suitably grooved rollers, and thereby reduced to a solid shell or tube. During the process of rolling, only the end of the mandril is allowed to enter between the rollers; it is kept back by an enlargement or collar which is fixed near one end, and comes in contact with a stopping frame or fence, the tube being drawn off the mandril by the combined friction and pressure as the rollers revolve. The process is performed immediately after the tube leaves the furnace, whilst at the required heat. The tube internally takes the form of the mandril, and externally the form of the combined groove made by the surface contact of the two rollers, and the tubes by gradually enlarging the grooves from end to end round the rollers, may be made to taper from one end to the other. Each roller may have three or four or more grooves, differing in size to match with the grooves in its companion roller, and the tubes are to be passed through one or more of the grooves, according to the nature and required finish of the work. The coiled or twisted tubes, after leaving the furnace at a welding heat, are treated in the same manner.

[Printed, 6d. Drawing. See *Mechanics' Magazine*, vol. 33, p. 396; *Carpmael's Reports on Patent Cases*, vol. 1, p. 578; *Rolls Chapel Reports*, 8th Report, p. 120.]

A.D. 1817, December 19.—N° 4191.

CHABANNES, JEAN FREDERICK Marquis de.

This invention relating to machinery adapted to the manufacture of metallic pipes, is designed for turning down the edges of the sheets or plates of copper, iron, lead, tin, and other metals or metallic compositions out of which such pipes or tubes are to be made. The machine operates upon the edge of the plate (which is secured by a screw press on a flat table or bed) by means of a roller, on the surface of which there is a projecting spiral rib that reaches from end to end, and takes between those two points not quite one turn round the roller; this roller is mounted in bearings carried by two levers, one at each end, and the levers are moved up and down for the purpose of bringing

the spiral rib on the roller into contact with the edge of the plate, by means of a treadle. As the roller revolves, which is effected by a handle on its axis or spindle, the spiral rib turns down the edge of the plate by the first revolution to a right angle therewith, and by the second or subsequent revolutions into the position of an acute angle to the surface of the plate. Both edges of the plate are thus operated upon, and after the plate has been turned into a tubular form, the edges which, then in a position to clasp or engage each other, are afterwards flattened down by rollers and thus form the seam.

[Printed, *6d.* Drawing. See *Rolls Chapel Reports*, 7th Report, p. 118.]

A.D. 1819, April 24.—No 4361.

PHIPSON, JOSEPH WEATHERLY.—This invention, relating to the manufacture of pipes and tubes adapted for the passage of gas and other purposes, is described by the inventor as follows:—

“ I take rolled copper of a thickness and breadth in proportion  
“ to the size of the tube required, and form the same into a tube  
“ by drawing it through a plate upon a mandrill or without a  
“ mandrill. I then cause the edges of the copper to be soldered  
“ together with bath metal or silver solder, so as to form a per-  
“ manent and safe joint. I then dress off the superfluous solder,  
“ and again draw the tube through the plate. This done, I take  
“ a piece of lead pipe and adapt it to the purpose in view by  
“ drawing it through a plate on a mandrill of the diameter of the  
“ tube required, and place it within the said copper pipe, and by  
“ passing through it a conical mandrill attached to a rod I force  
“ the lead pipe against the inner surface of the copper tube, so as  
“ to leave them in perfect contact with each other. Or I prepare  
“ a lead pipe upon a mandrill of the diameter of the tube re-  
“ quired, and draw over it a copper pipe already soldered, and  
“ pass them both together on the mandrill through a draw plate,  
“ so as to bring the interior surface of the copper and the ex-  
“ terior surface of the lead pipes into complete contact. The  
“ lead pipe is proof against the action of the gas, and serves to  
“ conduct it without the risk of escape; copper is not, but it  
“ supports and defends the lead, admits of a better polish, and  
“ is more pleasant to the eye than lead. Pipes or tubes thus  
“ constructed will conduct various fluids and inflammable  
“ gases.”

[Printed, *4d.* No Drawings. See *Repertory of Arts*, vol. 37 (second series), p. 73; and *Rolls Chapel Reports*, 8th Report, p. 133.]



A.D. 1820, April 11.—N° 4445.

BURR, THOMAS.—This invention relates to machinery adapted to the manufacture of pipes, and sheets of lead and other soft metal whilst in a heated but not molten state. The apparatus is operated by hydraulic pressure, and consists of a strong metal receiver or cylinder and a metal plunger free to slide therein. The top of the cylinder is securely closed by a die plate in which, concentric with the axis of the cylinder, and fixed in the top of the plunger projecting upwards, there is a steel rod or mandril, which when the plunger rises, passes concentrically through, but not in contact with the inside of the die, an annular space corresponding to the desired thickness of the pipe being left between them. Before the end of the mandril is raised to the die, the molten metal is poured into the cylinder, and as soon as it is set, the operation of raising the plunger begins. The result is that the hot metal is continuously squeezed upwards through the annular space between the die and the mandril in the form of a pipe or tube, the length of which is determined by the size of the cylinder, and the quantity of heated metal it contains, and the size of the pipe is regulated by the relative sizes of the die and the mandril, which may be changed for others.

Sheets of lead or other soft metal are made by apparatus constructed to act upon the same principle, but differing in form, inasmuch as, that the receiving chamber and plunger are rectangular, and instead of a circular orifice through the die, the metal is squeezed out through a narrow slit, in length corresponding to the desired breadth of the sheet, and in breadth to the desired thickness, which may be altered by screws, the plate which forms one side of the slit being adjustable.

[Printed, 4d. No Drawings. See Repertory of Arts, vol. 41 (*second series*), p. 267; London Journal (*Newton's*), vol. 1, p. 411.]

A.D. 1822, January 29.—N° 4641.

HAGUE, JOHN.—This invention relates to the manufacture of metallic pipes, tubes, or cylinders by means of a machine or apparatus, whereby the metal in a molten state is by mechanical pressure continuously forced out of a melting vessel through a fixed annular mould or die, and thereby at one operation formed into a pipe or tube, the mould or die being of sufficient length to cause the metal whilst passing through it to congeal, an effect which is hastened by the external application to the mould of cold water.

The apparatus consists of a trough to receive and melt the metal, having a fire-place under one end, from which a flue extends beneath the trough to the opposite end. At this end the trough is formed into a basin, deep enough to contain a cylindrical vessel and sufficient melted metal to cover it. The interior of the vessel is formed as a female screw to receive a male screw, which, being turned by suitable gearing, advances and forces the melted metal (wherewith the vessel has been filled) out through a mould or chamber, screwed to the end of the vessel, and fitted with a core. The discharge end of the mould is surrounded by a vessel filled with water for the purpose of chilling the metal, which then leaves the mould in the form of a pipe, tube, or cylinder, and "if made of metal capable of being coiled," it is coiled upon a revolving drum.

[Printed, 10*d*. Drawings. See London Journal (*Newton's*), vol. 5, p. 76; Engineers' and Mechanics' Encyclopedia, vol. 2, p. 55.]

A.D. 1822, February 5.—N<sup>o</sup> 4644.

**BILL, ROBERT.**—This invention relating to the construction of metallic tubes and cylinders suitable for masts and yards of vessels, beams, casks, and other tubular bodies requiring strength and lightness combined, consists in fixing inside an outer shell or cylinder formed of plate iron rivetted together at the seams, a series of rings or segmental sections of rings of angle iron, severally placed at intervals a greater or lesser distance apart as circumstances may require. These rings or segments fit to the internal circumference one flange of the angle iron being rivetted to the shell, whilst the other projects inwards and forms an internal stay or support. Iron casks are made in this manner, rings of angle iron being also rivetted round inside the ends which are fixed to the inside flange, the angle of the iron forming the corner. The strength of metal suitable for the construction of a cask is given, as also for a frigate's mast.

Describes a metal chain constructed with twisted plates or bars alternating with short double links, and devised for use as a substitute for rope shrouds and stays to metallic masts.

[Printed, 6*d*. Drawing. See London Journal (*Newton's*), vol. 4, p. 179; and Mechanics' Magazine, vol. 3, p. 432.]

A.D. 1824, January 19.—N<sup>o</sup> 4892.

**RUSSELL, JAMES.**—This invention, relating to the manufacture from wrought or malleable sheet iron of welded tubes, refers more particularly to the mode of working and to the machinery

employed. The plate iron, rolled to the required thickness, is cut into strips or narrow sheets, severally in breadth corresponding to the circumference of the tubes they are intended to make. The edges of these narrow sheets are bent up in the usual way, and they are by means of swages worked into a tubular form, the edges meeting together. They are then heated to a welding heat and separately subjected to the blows of a tilt hammer, which carries a semi-circular swage; the tube being laid in the corresponding half of the swage which is fixed in the anvil block, is advanced after each blow, so that the whole length of its seam is gradually operated upon. After this welding process the tube is reheated, and whilst being passed between grooved rollers, is forced over the head on to the stem or rod of a fixed mandril, the enlarged ovate-formed head of which rests in the opening formed between the rollers at the point where the grooves meet. By this means the cylindrical form of the tube is perfected, the grooves of the rollers operating upon it externally, whilst the mandril head supports and smooths the inside. "The advantages which are obtained by this mode of manufacturing gas pipes and other wrought-iron tubes over those at present in use, are that the internal and external surface will be perfectly cylindrical and parallel to each other, and that the irregularity occasionally arising from scales and other obstructions will be altogether obviated."

[Printed, 63. Drawing. See Repertory of Arts, vol. 6 (*third series*), p. 273; London Journal (*Newton's*), vol. 9, p. 20; Mechanics' Magazine, vol. 3, p. 281; Register of Arts and Sciences, vol. 2, p. 178; and Carpmmael's Reports on Patent Cases, vol. 1, p. 567.]

A.D. 1824, April 15.—N° 4942.

GETHEN, THOMAS.—The object of this invention relating to the manufacture of metallic pipes, rollers, cylinders, and articles of cast metal, is to produce such castings or articles of greater than the ordinary length, and at the same time assure a more sound and intimate cohesion of the particles of the metal than can be effected by the ordinary process. To this end a movable furnace is employed; this furnace, mounted on wheels which travel on rails, is capable of discharging the melted metal direct into the mould, instead of into a ladle or pot, in which it is usual to carry it from the furnace and pour it into the moulds. The moulds for a pipe or pillar are made in two longitudinal concave parts, which fit together on one side only, a long narrow slot or opening being left between them on the other side throughout



the whole length of the mould, which is placed in a frame in a vertical position, and as the casting of the metal proceeds, is caused to descend at a relative speed between guide rollers, there being fixed in front a long stop plate, which is kept in frictional contact with the face of the mould, so as to fill and cover the slot, and prevent the escape of the metal below the level of the outlet of the furnace as the mould descends. The melted metal runs into the mould through the slot over the top of the stop plate, the bottom of the mould being plugged and at the commencement of the operation raised to a level with the furnace. As the surface level of the metal rises in the mould, the latter gradually descends and fills, and a pipe or casting is produced equal to the length of the mould, whatever that may be. The core rods are made of metal or any hard and suitable substance, coated with paper or porous material, and channelled longitudinally to permit of the escape of gaseous or other vapour. The arrangements may be so modified, that motion during the casting operation may be imparted to the furnace, whilst the mould remains in a fixed position during the influx of the metal.

[Printed, 2s. 4d. Drawings. See London Journal (*Newton's*), vol. 9, p. 4.]

A.D. 1825, January 11.—N<sup>o</sup> 5077.

MAGRATH, THOMAS.—This invention relating to apparatus adapted to contain or conduct water and other fluids, and protect such fluid or fluids from the effects of frost, consists of a double pipe or tube of metal, comprising one tube so placed within another or larger tube, that an annular interspace is formed between them. This space is filled with either charcoal, cork, wool, or any other non or imperfect heat-conducting substance. In the same manner two vessels differing in size, but by preference corresponding in form, may be placed one within the other, and the interspace filled in the same manner. Instead of the outer vessel or jacket being composed of metal or the same material as the inner vessel, it may be made of wood or other suitable substance.

[Printed, 4d. No Drawings. See Repertory of Arts, vol. 3 (*third series*), p. 1; London Journal (*Newton's*), vol. 10, p. 192; Register of Arts and Sciences, vol. 3, p. 135.]

A.D. 1825, January 18.—N<sup>o</sup> 5084.

CHURCH, WILLIAM.—This invention relates to a mode of casting in vacuous moulds, cylinders, tubes, and other articles of



iron, the object being to render the metal of such castings more sound, free from air holes, dense, and uniform in texture than heretofore, and to case-harden the surface when required. To this end the mould, which is made of metal, is by means of a crane suspended in an upright position over an iron vessel, wherein upon a bed of charcoal the pot which contains the molten metal is placed, the whole weight of the mould when lowered resting upon the rim of the vessel in air-tight contact. Depending from the bottom of the mould is a pipe, made of infusible material and of sufficient length to dip into the metal and reach nearly to the bottom of the pot; the lower end of this pipe is closed by a soft metal cap. By means of an air pump all the air is exhausted from the mould, and the vessel containing the pot of metal is put into communication with a cylindrical vacuum chamber, otherwise when the soft metal cap melted, the molten metal would rise up the pipe into the mould. The air pump employed has double action, the upper section communicating with the mould above the piston works the exhaust, and the lower section beneath the piston forcing (when all is ready) air into the vessel above the metal, the communication with the vacuum chamber being then shut off. The molten metal then rises up the pipe into the mould. When the casting is required to be chilled on the surface, a continuous stream of cold water is caused to flow within a casing which incloses the mould.

[Printed, *6d.* Drawing. See Repertory of Arts, vol. 1 (*third series*), p. 271; and vol. 6 (*third series*), p. 269; London Journal (*Newton's*), vol. 11, p. 230; Mechanics' Magazine, vol. 6, p. 209; Register of Arts and Sciences, vol. 4, p. 117; Engineers' and Mechanics' Encyclopædia, vol. 1, p. 558; Rolls Chapel.]

A.D. 1825, February 26.—N° 5109.

WHITEHOUSE, CORNELIUS.—This invention relating to the manufacture of tubes adapted to convey gas, and to other purposes, consists in the heating of the iron intended to form the tube in a blast furnace to a welding heat, in which state it is withdrawn and, by means of a drawbench, passed through circular dies which, operated by a screw, press together and weld the two edges of the plate, that previous to the heating process have been turned up into the form of an open tube or gutter, the free end of the chain of the drawbench being furnished with a screw clamp or other suitable holding contrivance capable of dragging the tube through the dies. Instead of the screw press and dies a strong pair of long-handled pincers, having a conical mouthed

hole for the tube to pass through similar to the dies, may be employed. These pincers operated by the workman grasp the end of the tube, and whilst the tube is drawn through them, they are securely held against a standard attached to the frame of the bench, which is placed contiguous to the furnace.

A clerical error in the Specification of this invention was, after enrolment, on the 18th of January 1830, amended by permission of the Master of the Rolls, the word "wire" having been erroneously written instead of "fire."

[Printed, *6d.* Drawing. See Repertory of Arts, vol. 16 (*third series*), pp. 59 and 116; vol. 1 (*new series*), pp. 97, 164, 166, and 234; and vol. 3 (*new series*), p. 17; London Journal (*Newton's*), vol. 10, p. 254; vol. 4 (*conjoined series*), p. 145; and vol. 25 (*conjoined series*), p. 44; Mechanics' Magazine, vol. 30, p. 235; vol. 36, p. 365; vol. 40, p. 445; and vol. 41, p. 352; Register of Arts and Sciences, vol. 3, p. 150; Engineers' and Architects' Journal, vol. 2, p. 43; Engineers' and Mechanics' Encyclopædia, vol. 2, p. 301; Patent Journal, vol. 2, p. 629; Webster's Letters Patent, p. 13; Webster's Reports, pp. 455, 457, 459, 463, 465, 471, 472, 473; also p. 649 (note m.); Webster's Patent Law, p. 43 (also p. 136, case 114, and p. 140, case 164); and Supplement, p. 13; Carpmal's Reports on Patent Cases, vol. 1, pp. 531, 532, 557, 563, 564, 569, and 588; Jurist, vol. 7, p. 585; and vol. 9, p. 577; Dowling and Lowndes's Reports, vol. 1, p. 547; Compton, Meeson, and Roscoe's Reports, vol. 1, p. 864; Moore's Privy Council Cases, vol. 2, p. 496; Meeson and Welsby's Reports, vol. 11, p. 647; vol. 14, p. 574; and vol. 16, p. 633; Law Journal (Exchequer), vol. 12 (*new series*), p. 439; vol. 14 (*new series*), p. 353; and vol. 16 (*new series*), p. 145; Billing on Patents, pp. 27, 41, 87, 109, 111, 112, 127, 142, 147, 149, and 183; Clark and Fennelly's House of Lords Reports, vol. 1 (*new series*), p. 687; Patentees' Manual, p. 13; Law Times, vol. 5, p. 405, extension for 6 years (see No. 7982).]

A.D. 1825, July 16.—N° 5208.

HANCOCK, WALTER.—This invention relates to the manufacture of pipes and tubes, by preference from thin sheet iron or copper, and in some cases of wood. The sheet metal is cut into plates corresponding to the required length and circumference of the intended tube, a margin being allowed along each side for turning back, the two margins being bent over and flattened down both on the same side of the plate. The plate by the usual means employed for the purpose is then bent into a tubular form; the edges formed by turning the margins back are thereby caused to meet, and the margins projecting in opposite directions, are secured by a longitudinal clip or narrow plate having its edges turned down to slide lengthwise under the margins of the tube; when slid on it is hammered down close over the joint from end to end of the tube, which is afterwards strengthened by a binding of hoop iron helically coiled in a heated state, over the tube throughout its whole length, the edges of the several coils touching; the ends of the band are rivetted to the tube, which is afterwards

coated internally and externally with a cement composed of bees wax, linseed oil, resin, pitch, and tallow. In some cases melted tin is employed for the purpose.

When connecting the ends of these tubes, an overlaying tubular collar is adjusted over the joint, and interposed between it and the tube ends is a layer of the above cement, to which is added a proportion of india-rubber dissolved in turpentine.

"In turning a corner I use a cast-iron elbow."

Tubes made of wood are bound with hoop iron and cemented in the same manner.

[Printed, 4d. No Drawings. See Repertory of Arts, vol. 4 (*third series*), p. 10; London Journal (*Newton's*), vol. 13, p. 271; Mechanics' Magazine, vol. 9, p. 108; Register of Arts and Sciences, vol. 1 (*new series*), p. 196; Engineers' and Mechanics' Encyclopædia, vol. 1, p. 30.]

A.D. 1826, August 17.—N<sup>o</sup> 5403.

THOMPSON, JOHN THOMAS.—The object of this invention relating to the manufacture of metallic tubes adapted to the construction of bedsteads and other purposes, is to obtain strength combined with lightness. It consists in placing within the metal tubes heretofore employed, other metal tubes made of wrought iron or other suitable metal or composition. These inner tubes are in transverse section by preference triangular, altho' pentagonal or other polygonal form of tube may be used. They are to be made by any of the usual processes with their angles rounded and their edges firmly brazed or soldered together. The outer tubes are made out of narrow plates of sheet metal, along the centre of which prior to forming a plate into a tube, one of the rounded angular edges of an internal tube is to be affixed by soldering. The sides of the plate are then turned up, and it is gradually brought to a tubular form by a succession of passes through draw plates, and afterwards finished in the usual way. Instead of fixing the internal tube to the plate, both tubes may be formed before they are combined, the triangular or polygonal tube in that case being afterwards driven into the outer tube by a wooden mallet.

A variety of devices and contrivances are described and illustrated showing the manner in which the rails, testers, and stay-ropes of bedsteads are united to the pillars and other parts, also parts of bedsteads to be made on the telescopic or expanding principle, viz., one tube sliding within another.

[Printed, 10d. Drawing. See Repertory of Arts, vol. 5 (*third series*), pp. 107 and 251; London Journal (*Newton's*), vol. 14, p. 328.]



A.D. 1827, December 4.—N° 5573.

WINFIELD, ROBERT WALTER.—This invention relates to combining, filling, or partially filling, round and other shaped metal tubes and bars, with wood in the form of longitudinal segments, being sections of the internal space; a central opening being in most cases left to receive a bolt or rod, the ends of which protrude from the ends of the tube, and are screw-threaded to engage with nuts or screw-threaded holes, made in the parts to which the tubes are to be united.

These tubes made of various forms externally are to be used in the construction of bedsteads and for other purposes.

Curtain rods are formed by combining two metal tubes one within the other, the inner tube being screw-threaded at the ends to engage in holes and secure the balls or ornamental ends.

A variety of sections of these tubes, round, rectangular, or polygonal are described and illustrated, showing the segmental and other forms of the wood fillings, with which iron is sometimes combined; also their application in the construction of bedsteads.

[Printed, 8d. Drawing. See London Journal (*Newton's*), vol. 6 (*second series*), p. 337.]

A.D. 1828, April 26.—N° 5641.

BREIDENBACH, THOMAS.—This invention, relating to the manufacture of sheet metal tubes and other articles, consists of a kind of longitudinal moulding die or block in two parts, the meeting surface of each part having a corresponding semicircular groove, the two grooves forming between them when brought together a long cavity, transversely circular or otherwise, according to the form of tube or article required. The two parts are held together by means of dovetails, which gradually taper from end to end of the meeting surfaces of the moulding blocks, the upper half part sliding longitudinally between two dovetailed ribs, formed one along each side or margin of the meeting surface of the lower part or half, which is immovably fixed upon a suitable work-bench. The sheet of metal, partially bent, is laid over and forced into the groove of the lower half of the mould by a long mandril, of suitable form, transversely coinciding with the contour of the mould, which mandril remains, and then the upper half of the mould is slid over lengthwise, so as to compel the sheet of metal

to take the form of a tube, which after the operation is to be finished "in the usual way as other tubes are."

[Printed, 6d. Drawing. See Repertory of Arts, vol. 8 (*third series*), p. 83; London Journal (*Newton's*), vol. 7 (*second series*), p. 30.]

A.D. 1831, March 21.—N<sup>o</sup> 6097.

ROYL, GEORGE.—This invention, relating to the manufacture and process of welding tubes, is described by the inventor as follows :—" I take a piece of flat strip iron of suitable width and thickness, according to the tube required ; the iron is then heated and the edges turned over till they meet or nearly so in the form of a cylindrical tube ; when it has thus acquired this form, one part of it is again heated in an air furnace, into which it is introduced through a small aperture, the other part remaining outside of the furnace. This furnace has placed in front of it two rollers, such as are commonly used in rolling iron, and containing a groove of the size required for the tube, and behind the rollers is a sliding door to admit the iron into the body of the furnace. When the iron has acquired a considerable degree of heat, it is taken out of the furnace through the aperture and again introduced at a sliding door placed behind the rollers, with the part not heated projecting out of the furnace and resting in the groove of the lower roller (the upper roller having been elevated by means of a cross bar and lever moved by manual effort). When the iron is heated to a degree nearly approaching to fusion, the lever is pressed down, and the upper roller is thus brought into contact with the lower roller, the iron being included in the groove formed in both of them ; the rollers are then turned . . . . in the direction to roll out the iron, which in passing through the groove by the motion of the rollers exclusively is perfectly married or welded together on the two edges ; the tube being so perfectly married and welded together (except in that part of it which was not introduced into the furnace,) is then taken to a scraper, and being placed securely in the guage of such scraper, is connected by a pair of tongs and an iron bow to an upright rod standing on a horizontal movement, which movement is attached to a vibrating rod connecting itself with the axis of the engine, and by means of such movement the welded part of the tube is passed through the scraper, which extends its length, removes its scaly surface, and gives to it a smooth, regular, and neat appearance. The

“ same process is then used with respect to the reverse and unwelded part of the tube.”

[Printed, *Ed. Drawing.* See London Journal (*Newton's*), vol. 8 (*continued series*), p. 407.]

A.D. 1836, February 3.—N° 6995.

HARVEY, FREDERICK EDWARD, and BROWN, JEREMIAH.—This invention, relating to the process and the machinery employed in the manufacture of metallic tubes, forging and rolling metal, and for other purposes, consists in,—

1st. The preparation of the iron for skelps by rolling it in a heated state to such forms as are suitable for the production of cylindrical tubes. The skelps are parallel in width and their edges are either bevelled for lapping or left square for a jump joint, there being a sharp ridge formed along each edge to supply additional metal at the seam.

2nd. “ Partially bending or turning over a portion of the edges at the end of each prepared skelp by means of rolls having excentric and peculiarly formed grooves, and afterwards completing the bending of the whole length of the skelp (whilst still in a heated state) upon a stationary mandrel between a pair of rollers having semicircular grooves, or the same effect of bending may be obtained by passing the skelp through suitable forming moulds.”

3rd. “ After again heating the skelp to a welding heat in a hollow fire or air furnace, closing or welding the edges or junctions of such bent skelp upon a stationary mandrel by the external pressure of a pair of grooved rollers, between which the skelp is made to pass,” there being a bulb or enlargement at the end of the mandril at the point between the rolls, where their respective grooves meet, leaving just sufficient annular space for the passage of the skelp, which by the pressure is drawn in and forced forward upon the mandril. By this means the seam is welded and when necessary for reducing the size of the tube another pair of rolls with smaller grooves is disposed in a direct line at the back of the first pair, and the mandril is elongated and extends through their grooves, a second enlargement suited to the size of the grooves in the second pair of rollers being formed upon the mandril, so as to lie in the groove directly between them.

Double tubes for cutting transversely into chain links are formed by the same process, also tubes of triangular and other



form in transverse section, hollow tram and other rails, sash bars, rafters, hand rails, and a variety of other hollow articles.

[Printed, 10*d.* Drawing. See London Journal (*Newton's*), vol. 11 (*conjoined series*), p. 144; and Rolls Chapel Reports, 7th Report, p. 170.]

A.D. 1836, May 3.—N<sup>o</sup> 7081.

RUSSELL, THOMAS HENRY.—This invention, relating to the manufacture of welded iron tubes, refers more particularly to the apparatus employed for (at one operation) turning up the flat skelps to a tubular form by means of a pair of adjustable disc rollers with grooved or hollow peripheries, there being a circular plate so mounted to revolve on its axis, that it projects between the rollers and partially into the opening formed by their grooves.

This plate is for the purpose of keeping the turned over edges of the skelp slightly apart and in a direct line, so that the joint or seam of the tube when welded may be perfectly straight throughout its whole length. The pair of rollers are placed on the end of a draw-bench contiguous to the mouth of the heating furnace, and close behind the rollers there is a stop, against which the workman who, as soon as the skelp has passed through the rollers, seizes it with and holds the jaws of a pair of gripper dies or pincers, that by compression weld the seam of the skelp as it is dragged forward by the bench chain. By this means the edges of the flat skelp are turned up and brought over towards each other by the rollers, the edges are kept perfectly straight by the rotating circular plate, and the seam is welded immediately and the tube formed at one heat. "And in order most intimately  
" to weld the edges of such tube and thus make them capable of  
" bearing great pressure, I prefer the same should be successively  
" draw through two or more pairs of pincers or dies, each of less  
" dimensions than the preceding one."

[Printed, 8*d.* Drawing.]

A.D. 1836, November 24.—N<sup>o</sup> 7234.

ELLIS, THOMAS, and BURR, THOMAS.—This invention relating to the manufacture of sheets and pipes of lead, is supplementary to the invention of Thomas Burr, whose prior patent for the same bears date April 11, 1820, and according to which invention, lead was forced by pressure out of a cylinder through dies.

The present invention consists in elongating and forming an open chamber or cup-formed cavity at the top of the cylinder to



receive the die, which is also made cup-formed to hold melted tin. The die is held down by wedges, which pass laterally through the thick metal sides of the cavity and into a shouldered recess in the bottom, the whole being concentric with the axis of the cylinder beneath, which contains a plunger that is raised by hydraulic pressure when the apparatus is in operation. The bore of the pipes is formed by a mandril concentrically fixed in the top of the plunger, its end projecting upwards through the orifice in the die. The charge of metal in a molten state is poured through a channel into the top of the cylinder, between the top of the plunger and the die, and as the plunger rises, the metal having set is squeezed out through the annular opening formed between the plunger and the die, the size of which opening is determined by the relative size of each.

The cup of the die contains molten tin, which coats the exterior of the pipe as it is forced upwards through the die, and the inside is coated by pouring melted tin into the top of it as soon as it rises above the mandril.

Sheet lead is first made tubular and then slit open longitudinally and partly opened during the process.

[Printed, 6d. Drawing. See Repertory of Arts, vol. 8 (*new series*), p. 31; London Journal (*Newton's*), vol. 11 (*conjoined series*), p. 6.]

A.D. 1837, August 31.—N<sup>o</sup> 7427.

HANSON, JOHN, and HANSON, CHARLES.—The object of this invention relating to the manufacture of pipes and tubes of lead, tin, and alloys of soft metal, is to improve the machinery or apparatus described by Thomas Burr in the Specification of his invention for which Letters Patent dated April 11, 1820, No. 4445, were granted to him, and which said invention consisted in the construction and use of machinery or apparatus capable of forcing such soft metals or alloys of soft metals through annular apertures formed between dies and central mandrils, so soon as the metal after being melted, had set or resumed its solid state. The present invention consists:—

1st. In place of the long mandril which is fixed projecting from the bottom of the piston or plunger of the hydraulic press, and moving therewith passes concentrically through the die, applying a short stationary mandril for the purpose of forming the internal bore of the pipe or tube; this mandril is rigidly fixed to a bridge piece inside the cylinder of the press and concentric with the die opening, its lower end protruding through it.

2nd. An arrangement of the dies, which are capable of adjustment laterally, whereby they are brought concentric with the mandril. The dies and mandril are also so constructed as to be capable of removal, giving place to other dies and mandrils when pipes of larger or smaller size are required.

3rd. A quadruple arrangement of dies and mandrils at the bottom of the press cylinder, whereby four pipes are made simultaneously, such pipes being forced out in lateral directions at opposite angles.

4th. Fixing a bridge guide piece inside the bottom of the cylinder above the die for the purpose, when Burr's long mandril is used, of giving it lateral support and guiding it concentrically through the die. The melted metal in all cases is fed into the cylinder through a side aperture situated just below the bottom of the plunger when it is raised to its fullest height, the aperture being afterwards closed by a plug; the operation begins so soon as the metal sets or solidifies, and the force is applied downwards, the metal in the form of a pipe being forced through the die at the bottom in contradistinction to Burr's process, where the action of the plunger was upwards, the liquid metal being in his invention poured in at the top through the die.

5th. Relates to the construction of the plunger or piston, which is fitted with an annular spring packing of metal for the purpose of preventing leakage.

A Disclaimer and Memorandum of Alteration in the wording of the original title of this invention is published with the Specification.

[Printed, 1s. 6d. Drawings. See London Journal (*Newton's*), vol. 16 (*conjoined series*), p. 344; and vol. 21 (*conjoined series*), p. 476, for Disclaimer.]

A.D. 1837, December 2.—N° 7494.

OCCLESHAW, WILLIAM. — "Certain improvements in the machinery or apparatus for manufacturing pipes or tubes or other similar articles from lead or other metallic substances."

[No Specification enrolled.]

A.D. 1838, June 27.—N° 7707.

GREEN, CHARLES.—This invention relates to the manufacture of brass and copper tubing, which is made from cast tubular ingots by a process of drawing through dies or drawplates, by means of an apparatus or draw bench of greater power than those in ordi-

nary use, the operation being repeated until, by successive drawings through dies or holes relatively diminishing in size, the tubular ingot which is placed upon a suitable mandril, is gradually elongated and reduced externally, and the metal contained in it is by the process extended, and ultimately assumes the form of a seamless tube, the diameter of the mandril determining the size of the interior or bore. During and after the process the tube requires annealing, the mandril being removed.

The draw chain of the bench is coiled round a worm wheel, which is actuated by a worm on the first motion shaft in connection with the motive power, the holder which receives the screwed end of the mandril, being connected to the free end of the chain.

A modification of the dies or drawplates consists of four rollers, which have grooved peripheries that meet and form a circular orifice, the rollers being mounted relatively at right angles, and by pressing upon the tube as it is drawn through the opening thus formed between them, cause its reduction and elongation, whilst much of the friction is avoided.

In order to remove the mandril from the finished tube without injury, and so prevent puckering or splitting, the tube is slid within another tube, and kept there whilst the mandril is drawn out.

The invention for which letters patent were granted to John Wilkinson in the year 1790, is referred to.

[Printed, 1s. 4d. Drawings. See London Journal (*Newton's*), vol. 15 (*conjoined series*), p. 416.]

A.D. 1838, December 17.—No 7909.

CUTLER, JOB.—This invention relates to a combination of metals applicable to the manufacture of tubes and pipes and other purposes, and to apparatus employed for preparing the edges of the plates made to form tubes and pipes therefrom, and from other metals and metallic combinations. The proportions of metal suitable for a combination adapted to the manufacture of tubes for locomotives and other steam boilers, consists of 22 lbs. of copper, 10 lbs. of iron, and 10 ounces of nickel. These quantities are to be altered according to the use to which the combined metal is to be applied. The metals are combined in a casting pot placed in an ordinary casting furnace, and when red hot the nickel is first introduced and then the copper, the iron being added when the other metals are in a state of fusion, a small quantity of sal

enixum and borax being used as a flux. When fused and at a white heat, a  $\frac{1}{4}$  of an ounce of crude tartar or a  $\frac{1}{4}$  to  $\frac{1}{2}$  an ounce of argol, and a tea spoonful of "turp's mineral" finely powdered is added; the compound, covered with coke or charcoal, after being kept at a white heat in the furnace for 20 minutes is taken out and the pot skimmed; about an ounce of borax is then stirred in, and the metal is kept in motion whilst it is poured into an ingot or pig mould. When broken up it is again melted, more flux is added, and if desired tin or zinc. Large quantities are combined in a suitable furnace.

As regards the manufacture of tubes and pipes from plates of metal whether combined or otherwise, the invention consists in bevelling by means of rollers the edges of such plates which lap together to form the joint, the bending of the plates to the tubular form, and the soldering or brazing of the joints, being afterwards performed by any of the known processes in ordinary use.

[Printed, 8d. Drawings. See *Mechanics' Magazine*, vol. 32, p. 337.]

A.D. 1839, February 26.—No 7982.

RUSSELL, JAMES.—An extension for six years of the Letters Patent bearing date Feb. 26, 1825, No. 5109, granted to Cornelius Whitehouse for "Certain improvements in manufacturing tubes for gas and other purposes," which Letters Patent were by him assigned to the above James Russell, the extension containing a proviso that he the said James Russell shall secure to Cornelius Whitehouse the sum of five hundred pounds per annum during the said term of six years.

[Title printed. See *Repertory of Arts*, vol. 16 (*third series*), pp. 59 and 116; vol. 1 (*new series*), pp. 97, 164, 166, and 234; and vol. 3 (*new series*), p. 17; *London Journal (Newton's)*, vol. 10, p. 254; vol. 4 (*conjoined series*), p. 145; and vol. 25 (*conjoined series*), p. 44; *Mechanics' Magazine*, vol. 30, p. 235; vol. 36, p. 365; vol. 40, p. 445; and vol. 41, p. 363; *Register of Arts and Sciences*, vol. 3, p. 150; *Engineers' and Architects' Journal*, vol. 2, p. 43; *Engineers' and Mechanics' Encyclopedia*, vol. 2, p. 301; *Patent Journal*, vol. 2, p. 629; *Websters' Letters Patent*, p. 13; *Webster's Reports*, vol. 1, pp. 455, 457, 459, 463, 465, 471, 472, and 473; also p. 640 (note m); *Webster's Patent Law*, p. 48 (also p. 138, case 114, and p. 140, case 164); and *Supplement*, p. 13; *Carpmael's Reports on Patent Cases*, vol. 1, pp. 531, 532, 557, 563, 564, 569, and 588; *Jurist*, vol. 7, p. 585; and vol. 9, p. 577; *Dowling and Lowndes's Reports*, vol. 1, p. 347; *Compton, Meeson, and Roscoe's Reports*, vol. 1, p. 864; *Moore's Privy Council Cases*, vol. 2, p. 496; *Meeson and Welsby's Reports*, vol. 11, p. 647; vol. 14, p. 574; and vol. 16, p. 633; *Law Journal (Exchequer)*, vol. 12 (*new series*), p. 469; vol. 14 (*new series*), p. 353; and vol. 16 (*new series*), p. 145; *Billing on Patents*, pp. 27, 41, 87, 109, 111, 112, 127, 142, 147, 149, and 183; *Clark and Finnelly's House of Lords Reports*, vol. 1 (*new series*), p. 687; *Patentees' Manual*, p. 13; *Law Times*, vol. 5, p. 495, extension for 6 years (see No. 7982).]



A.D. 1840, March 27.—N° 8453.

STOCKER, ALEXANDER SOUTHWOOD.—“ Certain improvements in manufacturing tubing or tubes which are applicable to gas and other purposes.”

[No Specification enrolled.]

A.D. 1840, March 27.—N° 8454.

PROSSER, RICHARD.—This invention relates to the manufacture of welded iron tubes, comprising the machinery and apparatus employed for bending the skelps, for welding the seams and forming the tubes, and also the construction of the heating furnaces.

The skelps or narrow iron plates prepared in the usual way have for a short length at one end their two side edges turned up, and the extreme end is bent over so that the two corners come together and approximate in form to a circle. The skelps thus prepared are placed in a reverberatory or other furnace, and when heated to a welding heat are taken out and in succession presented (bent end first) to the welding and forming machine. In this machine are four disc rollers driven at a uniform speed by tooth gearing, and so disposed relatively that at an intermediate point their peripheries (which are grooved) meet together and collectively form a circular opening or die of the size required for the external diameter of the tube, the size and form of the interior of which is regulated by an enlargement or bulb of steel on the end of a long mandril rod, which in its fixed position lies in a direct line pointing to the circular opening formed between the rolls, and into which its enlarged end is projected. This mandril lies along the heated skelp, and as the latter is drawn in by the grip or pressure between the rollers, the edges are gradually turned over it, and meeting in the die opening are forcibly pressed into intimate contact and welded together by the combined pressure of the rolls externally and the resistance of the mandril inside, the rod of which is rigidly and immovably fixed. Tubes of other form than circular may be made in the same manner, the grooves in the rollers and the enlarged end of the mandril being shaped in conformity therewith. The action of the machine is very rapid, only two seconds of time being required for the passage through and welding of each tube. Two or more of such machines may be employed, the tubes passing rapidly from the first to the second, and so

on, each succeeding machine having rollers with grooves of diminished size.

Instead of turning up the edges of the skelps for only a portion of their length, they may be prepared and brought into a trough-like form by hammering or otherwise, or they may be caused to enter between the rollers through a trumpet-formed mouthpiece.

[Printed, 2s. Drawings.]

A.D. 1840, April 4.—N° 8464.

SMEDLEY, THOMAS.—This invention relates to the construction of machinery adapted to the manufacture of seamless tubes, pipes, and cylinders; also to the mandril employed.

These tubes and pipes are by a rolling, compressing, and reducing process, made from cast cylinders or tubular ingots of copper or its alloys, in substance much thicker and shorter than the tubes and pipes they are intended to produce. The rolling machinery employed operates by means of four disc rollers, so disposed relatively that their peripheries which are grooved meet (each representing 90° of a circle), and forming a circular opening, they act collectively as a revolving die, compressing and elongating the cast cylinder as it is passed through them in a heated state upon a mandril. All the four rollers are caused to revolve at a uniform speed by suitable gearing, and the cast cylinder is drawn into and through the die opening by the grip and pressure of the rolls, no apparatus being employed to drag it through, as was the case in Wilkinson's patent rolling process, to which the patentee refers; this patent is dated March 13, 1790, No. 1735.

Several sets of the rolling apparatus with die openings relatively graduating to a small size are employed, through a part or all of them in succession the tube is passed until it becomes extended and eventually reduced to the required size, the elongation of the tube being caused by the pressure of the rollers alone without dragging or drawing, which, it is stated, "tends to injure the texture or frame of the metal."

The mandril, which has the form of a circular rod, is composed of three longitudinal parts, and when required to be withdrawn the center piece or part is driven out, so as to leave the two side parts loose in the tube.

[Printed, 10d. Drawing. See Repertory of Arts, vol. 14 (*new series*), p. 332; and *Mechanics' Magazine*, vol. 33, p. 398; *Inventors' Advocate*, vol. 3, p. 229.]

A.D. 1840, June 9.—N° 8536.

**STOCKER, ALEXANDER SOUTHWOOD.**—This invention, relating to the manufacture of seamless tubes, consists in :—

1st. Making such tubes from cast tubular ingots of brass composed of 60 lbs. of best copper, and 40 lbs. of zinc, to which if desired in order to make the compound metal hard and close 12 lbs. of tin may be added, the object being to produce a metallic compound that will bear working at a low red heat. The heated tubular ingot placed upon a mandril that slightly tapers a sixteenth of an inch from end to end, is passed between rollers having grooves severally graduating in size, similar to the rollers employed for rolling iron, the larger grooves being used first, and the others in succession according to size, until the ingot is elongated upon the mandril and reduced to the diameter required, the unfinished tube during the process being reheated if necessary, and after the process in order to finish the tube it is whilst on the mandril immediately drawn through a draw-plate.

2nd. Making seamless tubes from malleable cast-iron tubular ingots, which are first annealed and being placed upon a mandril in a heated state, are elongated and reduced by a succession of passes between grooved rollers in a manner similar to that already described. It is preferred that the same description of rich iron ores from which the malleable cast iron is made, be used as the annealing material wherein the ingots are embedded and subjected to a bright red heat for about eight days.

[Printed, 4d. No Drawings. See Repertory of Arts, vol. 15 (*new series*), p. 358; *Mechanics' Magazine*, vol. 33, p. 607; *Inventors' Advocate*, vol. 3, p. 389.]

A.D. 1841, January 14.—N° 8793.

**JONES, ALEXANDER.**—This invention relates to the manufacture of “tubes and vessels of copper deposited or thrown down in “the form and of the substance of the tube or vessel required to “be manufactured, by the action of voltaic electricity.” The arrangements for working the process are as follows :—

A solid or other mould is prepared, either of metal such as lead, or when of wood, earthenware or other non-conducting material, it must be converted into a conductor by a coating of nitrate of silver or other suitable substance, either applied by a brush or by immersion. This mould surrounded by a cylinder of copper is placed in a vessel containing a salt of copper, either nitrate, or a



solution of the sulphate, which is preferred, and by means of wires, the mould and cylinder are put into communication with a galvanic battery, the mould with the positive plate or section, and the cylinder with the negative. The battery being excited to action by any of the usual methods, begins to deposit the copper on the mould, and this is continued for 5 or 6 days, when the operation is complete, during which time for each portion of copper deposited, a corresponding quantity of the metal is eroded or dissolved from the copper cylinder.

The new formed vessel or tube is afterwards removed from the mould either by force or heat, according to the nature of the material of which the latter is composed. Instead of surrounding the mould with a copper cylinder, scraps of copper disposed around but not in contact with the mould, may be used. In some instances vessels are formed in separate sections, which are afterwards united by the same means, their principal surfaces during the process being protected by a non-conducting substance such as common resinous varnish, the edges only which are to be united being exposed to the electrical action.

[Printed, &c. Drawing. See London Journal (*Newton's*), vol. 19 (*conjoined series*), p. 106; *Mechanics Magazine*, vol. 34, p. 399; *Inventors' Advocate*, vol. 4, p. 324.]

A.D. 1841, January 21.—N° 8804.

PERKINS, ANGLIER MARCH.—This invention relates to the construction of hot water heating apparatus and to the manufacture of pipes and tubes adapted to convey the heated water, and to other purposes.

The new arrangement of the heating apparatus consists in returning the pipes to the furnace, in order that the water may be reheated as often as it is required to be circulated in a new direction.

As regards pipes or tubes the invention is more particularly applicable to those which are cast, and refers also to the manufacture of the unions or couplings whereby they can be more conveniently and securely jointed together, for which purpose the moulds and apparatus employed are constructed to produce screw joints and couplings of a peculiar kind. The core which in the casting process forms the bore of the pipe, is made in the usual way, but the ends of the pipe pattern or model are furnished, one with a right-handed screw, and the

other with a contrary or left-handed screw, and from the mid-length to each end respectively of the union coupling interiorly, are formed screw-threads, one end right-handed, and the other left, so that when the ends of the two pipes are entered respectively into the ends of a screw coupling or union, and the latter is turned on its axis by a suitable wrench, the ends of the two pipes are drawn together, a suitable elastic packing being interposed between them to make a sound joint. It is preferred to form the screw-threaded cores for the screw couplings in metal moulds.

Expansion joints between socketted and plain ended pipes are made by casting a screw thread in the end of the socket to receive a short piece of pipe or gland, which is screw-threaded externally, is slightly conical inside, and is slid on the end of the plain pipe; an annular packing of suitable material is placed in the bottom of the socket, and this is pressed upon by a metal ring against which the end of the short pipe, when screwed into the socket, comes in frictional contact. By this means the packet is compressed in the socket and forms a water-tight junction between the two pipes, whilst the ends have slight lateral liberty, by reason of the conical form of the inside of the gland.

[Printed, 1s. Drawing. See Repertory of Arts, vol. 16 (*new series*), p. 215; Mechanics' Magazine, vol. 35, p. 142; Inventors' Advocate, vol. 5, p. 70; Transactions of the Society of Arts, vol. 54, p. 168.]

A.D. 1841, February 8.—N<sup>o</sup> 8838.

**GREEN, CHARLES.**—This invention relating to the manufacture of tubes of brass or copper, made without seam by a process of drawing out or elongating short cast cylindrical ingots or tubular rings, is supplementary to a prior patent granted to this inventor and bearing date June 27, 1838, No. 7707, and consists:—

1st. For the purpose of facilitating the process, in forming within the casting or tubular ingot at one end, a rim to form a stop for the mandrel, which has a corresponding shoulder instead of being coniform at the end as heretofore.

2nd. Relates to a mode of readily and effectually placing and attaching the end of the mandril to the holder which draws the brass or copper ingot through the draw-plates or dies. For this purpose on the end of the mandril is formed a shallow projection or head, and in the holder there is a corresponding recess to receive it, and a pin or cotter to secure it in its place whilst

the tubular ingot is drawn by chains operated by powerful machinery, through a succession of dies or draw-plates, and thereby gradually extended and reduced to the desired size, the draw benches and apparatus employed in the process being fully described and illustrated, also a bench adapted to the purpose of inserting the mandrils into the tubular ingots preparatory to the drawing process.

Tubes intended for boiler purposes are made stronger at that end which is placed contiguous to the furnace; this is effected by casting the tubular ingot internally smaller at one end and reducing the size of the corresponding end of the mandril.

3rd. Casting and drawing brass or copper tubes adapted to receive engravings for the use of calico printers, such rollers having formed internally at one end an annular rim, and also throughout their whole length a projecting rib, which slides in a longitudinal groove cut along one side of the mandril, which is also shouldered, to correspond with the rim.

[Printed, 2s. 8d. Drawings. See *Mechanics' Magazine*, vol. 35, p. 190; *Inventors' Advocate*, vol. 5, p. 100.]

A.D. 1841, May 22.—N° 8963.

WOODS, JOSEPH.—This invention relates to the constructional details of locomotive engines, comprising the use of wheels loose on their axis for curving, lubricating apparatus and reversing gear; to the universal union joints which unite the pipes that form the connection between the tank of the tender and the engine pumps; to a fog whistle to be placed in front of the engine; and to a rotary disc engine, which may be driven as a motor by the elastic pressure of steam or the hydrostatic pressure of water, and when actuated by motive power, it may be used as a force pump.

The union junction designed for connecting the pipes which convey the water from the tender to the engine pumps, either for a single or double feed, consists of a channel way formed by a combined arrangement of tubes, elbows and branches, so swivel jointed together in sockets, as to be capable of a self adjustment that will yield readily to any lateral, vertical, or longitudinal strain or separate movement of either engine or tender.

[Printed, 1s. 8d. Drawings. See *Mechanics' Magazine*, vol. 5, p. 489; *Artizan*, vol. 3, p. 42; *Inventors' Advocate*, vol. 5, p. 357.]

A.D. 1841, November 6.—N° 9140.

CUTLER, JOB.—This invention relates to the manufacture of welded iron tubes for use as flues for steam boilers, and to the coating of iron tubes with copper or copper alloyed. The skelp or band of iron intended to form a tube has its edges chamfered, in order that when the skelp is bent into a tubular form the edges may lap together. It is then, after having been placed in a furnace and its edges have become heated to a welding heat, drawn upon a mandril through elongated dies, or passed between grooved rollers placed upon the draw bench, the heating furnace being placed contiguous thereto. The pressure between the dies or the rollers externally and the mandril within squeezes and welds the two edges of the skelp firmly together. The tubes when cold are placed in diluted muriatic acid, and having afterwards been washed to free them from the acid and all oxide, they are dressed over with a mixture composed of grease and powdered black lead, and finally either in a hot or cold state they are again placed upon a mandril and drawn through similar dies. This last process equalizes the thickness of the tubes throughout, smoothes them both externally and internally, closes the pores of the metal and lays its grain in one direction.

According to another method of welding the seams of iron or steel tubes, hammers worked at a high rate of speed are used; these deliver a succession of blows along the seam, the tube being drawn through the groove of a swage or anvil over a mandril, whilst the hammers operate upon and weld the seam, suitable appliances for gripping and dragging the tube being provided. The tube before it has time to cool is then passed through dies.

Iron tubes are inserted within tubes of copper, or of copper and its alloys, and by means of a draw-bench, either upon or without a mandril, drawn through dies or passed between rollers, and by repeating this part of the process, they are at length reduced to the size required. Osborn's Patent, dated March 1, 1817, No. 4105, is referred to.

[Printed, 10d. Drawing. See Repertory of Arts, vol. 18 (*new series*), p. 137; Mechanics' Magazine, vol. 37, p. 288; also vol. 51, p. 21; Patent Journal, vol. 4, p. 61; vol. 6, pp. 69 and 158; and vol. 7, p. 134; Carrington and Kirkman's Reports, vol. 3, p. 215; Law Journal (Queen's Bench), vol. 17 (*new series*), p. 217; Queen's Bench Reports, vol. 11, p. 973; and vol. 14, p. 372 (*note*); Macroy's Reports, pp. 119, 124, 136, 137, and 138; Law Times, vol. 12, p. 512; and vol. 27, p. 94; Jurist, vol. 12, p. 721; Rolls Chapel.]

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A.D. 1841, December 16.—N° 9187.

**CHURCH, WILLIAM, and HARLOW, JONATHAN.**—This invention relates to the manufacture of metallic tubes, and to a method of uniting them to other tubes or pieces, for the purpose of forming the framework of bedsteads, and articles of furniture, also iron hurdles, fences, and other uses to which they are applicable.

These tubes are made to vary in diameter throughout their length, either gradually tapering or enlarging and diminishing according to the design and form required. These various forms of tube are produced by the use of two rollers from sheets of metal previously cut to the required shape. The rollers disposed horizontally are mounted one above the other in appropriate side frames, and they are caused to revolve at a uniform speed by a pair of tooth wheels fixed, one on the axis of each roller. The surface of these rollers respectively is divided longitudinally into two sections by two deep channels cut or sunk along the opposite sides of each, and the segmental surfaces which remain are grooved crosswise, such grooves varying in breadth and depth according to the amount of taper or form required, the variations in the size of the grooves of one roller corresponding exactly with the grooves of the other, so that when they operate on the sheet of metal as it is drawn between them, they act as revolving draw plates or dies, their tendency to revolve being retarded by a weight depending from the periphery of a large pulley or wheel fixed on the end of the axis of the lower roller.

The unions or parts which connect these tubes to other tubes or pieces are cast on to their end or ends, the moulds having dovetails or tenons to enter and fit into hollow dovetails and mortises formed in the parts to which they are to be attached, either in right angular position or otherwise. Many examples of this part of the invention are described and exhibited in the drawings.

[Printed, 2s. 8d. Drawings.]

A.D. 1842, March 7.—N° 9287.

**RUSSELL, THOMAS HENRY, and WHITEHOUSE, CORNELIUS.**—This invention relating to the manufacture of wrought iron tubes, the seams of which are welded by the pressure of dies wherethrough the heated skelps are drawn, refers more particu-

larly to the use of a loose bar or mandril, as a means of affording the necessary internal support to the seam of the tube against the external pressure of the dies, which are rigidly held to a draw-bench, and have the form of tongs or grippers, the opening or die being bell-mouthed and formed partly in one jaw and partly in the other. The skelp bent to a tubular form and heated to a welding heat, the rod or mandril being within it, is drawn successively through three pairs of dies, each pair differing in form. The pass through the first pair of dies laps the edges of the skelp and partly welds them; it is next passed twice or thrice through the second pair of tongs which completes the welding of the seam reheating being resorted to when necessary. By reason of the mandril being smaller in diameter than the intended finished size of the tube, and the opening in these dies being ovate, the tube assumes a corresponding form, the mandril becomes fixed between its minor diameter, with the welded seam lying close to it along one side. The third pair of dies have a circular opening corresponding to the finished size of the tube, which when drawn through is made circular, and the bar or mandril is liberated. Instead of using the tongs or gripper dies, the grooved rollers described in the Specification of Letters Patent, No. 5109, granted February 26, 1825, to Cornelius Whitehouse, may be employed in combination with the mandril to weld and finish the tubes.

[Printed, 16d. Drawing. See Repertory of Arts, vol. 18 (*new series*), p. 288; Record of Inventions, vol. 1, p. 96; Rolls Chapel.]

A.D. 1842, July 6.—N° 9403.

**SCOTT, JOHN HARRISON.**—This invention relates to several arrangements of a method of joining or connecting together the ends of metal pipes; also to a method of making expansible connections, consisting:—

1st. In connecting cast-iron pipes by means of screw threads cast on one end of the pipes and annular nuts cast loosely round them at the other end, each pipe and nut being cast at one operation.

2nd. In this case the annular nut is cast first, and afterwards the pipe with the screw-threaded end is cast inside it, the nut being coated internally with loam.

3rd. First casting the pipe with the screw-threaded end, and afterwards casting the annular nut around the pipe in a suitable core box, the pipe being coated with sand or loam; in ~~all~~ cases

these nuts are loose; they are prevented sliding off the plain ends of the pipes by a shallow flange or collar cast thereon, and they are intended to engage with the screw threads which are cast on the ends of the pipes with which the connection is to be formed.

4th. Relates to connecting wrought iron and soft metal pipes in the same manner, a collar screw-threaded being fixed on one end of a pipe, and when the annular nut is slid loosely on the other end, the latter is heated and jumped up or enlarged to prevent its sliding off, packing being interposed between the meeting ends when the pipes are brought together.

5th. Relates to a method of connecting pipes liable to expansion and contraction. In this arrangement the plain end of one pipe is passed inside the end of the other pipe, which is socketted and screw-threaded externally to engage with an annular nut that forces a packing of hemp or other suitable material lapped round the pipe into the socket between the two surfaces, so that the end of one pipe has liberty to slide to and forth in the end of the other, the action being limited by a groove in the socket of the one pipe and a fixed stud on the other.

[Printed, &c. Drawing. See *Mechanics' Magazine*, vol. 38, p. 104; and *Record of Patent Inventions*, vol. 1, p. 434.]

A.D. 1843, April 20.—N° 9703.

RAND, JOHN.—This invention relates to a process of manufacturing tubes from short thick tubular rings of soft metal, respectively containing a sufficient substance of the metal to produce when elongated a tube the required length and size. These short tubular rings may be cast to form, or produced in any other convenient manner. The apparatus employed comprises an annular die disposed at the bottom of a cylindrical chamber, which receives the soft metal tubular ring. A plunger fitting accurately into the inside of the chamber descends therein, and is furnished with a mandril, the end of which projecting downward from its lower end passes concentrically through the die. The tube is produced by hydraulic or other pressure on the upper end of the plunger, which has the effect of forcing the soft metal through the annular space formed between the mandril and the die, both of which require to be lubricated with oil, grease, or other suitable fatty substance, to facilitate the operation. By this mode of producing tubes, the injury to the die and working parts of the apparatus, resulting from the heat of the molten metal



when according to previous processes it is poured into the receiving chamber, is avoided.

The apparatus may be arranged to make tubes varying in thickness, according to the relative sizes of the dies and mandrils, and taper tubes, tubes with a closed end, and tubes for general purposes may be produced.

The dies are made of tempered steel and very strong, especially for making tubes of tin, and instead of the receiving chamber and plunger respectively being made of one piece of steel, they may be formed by laminating thick steel plates, the surfaces of which must be ground and accurately fitted together.

[Printed, 10d. Drawing. See Repertory of Arts, vol. 3 (*enlarged series*), p. 27.]

A.D. 1843, April 20.—N<sup>o</sup> 9707.

PROSSER, RICHARD, and CUTLER, JOB.—This invention relates to the manufacture of pipes and bars, and their application to various purposes.

1st. Connecting the ends of wrought iron gas or steam pipes. Instead of inserting the screw-threaded ends of two pipes into an internally screw-threaded short loose union pipe or socket, one end of each pipe is enlarged and formed into a permanent socket by a machine adapted to the purpose; these sockets are screw-threaded internally to receive the plain end of a pipe, which carries a screw-thread externally. The pipe with its end heated to a welding heat is held between two dies, sufficient of the heated portion to form the socket being left projecting, to be operated upon by a punch and a socket die, or as they are called two hammers, one interior to the other; these are thrust forward by eccentrics alternately, the thrusts of the punch having the effect of opening or expanding the heated end, whilst the socket die keeps it in form externally.

Describes a machine for scraping or smoothing iron tubes externally by means of four circulating cutters, which by means of springs are pressed upon the outer surface of the tube whilst it is passed between them. By using two machines or two sets of cutters circulating in opposite directions, the rotation, or the twisting of the tube is prevented.

Describes another machine for clearing off or removing external projections or superfluous metal from iron pipes or bars. This machine operates by means of cutters, which are caused to close

upon the pipe or bar by a weighted lever. It is intended to work in concert with a welding machine, for which a patent was granted to Richard Prosser, bearing date March 27, 1840, No. 8454.

Fluting, shaping, and ornamenting metal tubes by drawing them in a heated state between roller dies. If the tubes are required to be ornamented, then the roller dies must be engraved accordingly.

Turning up the edges of narrow flat plates to form tubes by means of a combined apparatus operating by the aid of a "wurtle" and pressing rollers, the plates being heated to a red heat.

Cleaning scale, oxide, or other superfluous substance from the surface of welded metal pipes, by means of steel or wire brushes which revolve in contact therewith.

Constructing bedsteads out of metallic tubes or bars.

[Printed, 3s. 2d. Drawings. See Transactions of the Society of Arts, vol. 54, p. 160; Rolls Chapel.]

A.D. 1843, May 9.—N° 9723.

ROOSE, JAMES.—This invention relating to the manufacture of wrought-iron tubes, consists (for the purpose of supplying internal support during the welding process in combination with a draw-bench) in the employment of a fixed mandril or rod having an enlargement or bulb at its end which terminates in the dies, the point or fore end of the bulb projecting through in front; the skelp, which is heated to a welding heat in a contiguous furnace, is dragged through the dies on to the mandril rod or stem by the chain of the draw-bench, the bulb being inside and filling the tube at the point of pressure, thereby affording the necessary internal resistance and support as the welding of the seam or lap joint progresses, the skelp being reheated, and the drawing repeated until the welding is complete. The dies employed are formed by the closing jaws of powerful tongs, which are held against a fixed support that forms a part of the draw-bench. Instead of tongs or gripper dies, grooved rollers, which are caused to rotate when the skelp is dragged between them over the bulb of the mandril on to the rod may be employed. The furnace is disposed at the fore end of the draw-bench, and to the back end, the tail of the mandril rod, the bending of which is prevented by a sliding tube, is secured.

The manner in which the process of welding is performed by grooved rollers placed in front of the draw-bench instead of by

the die tongs is described, as also the drawing pliers which are attached to the draw-chain and grasp the end of the heated skelp.

[Printed, 6d. Drawing. See London Journal (*Newton's*), vol. 25 (*combined series*), p. 258.]

A.D. 1844, March 14.—N° 10,098.

HARRISON, CHARLES.—This invention, relating to the manufacture of cast-iron pipes and of cylindric articles, consists in so forming the moulds, that not only several castings may be obtained therefrom, but it is stated labour is saved, and the castings produced are superior to those ordinarily made in loam or sand moulds, which are severally broken up after each casting is made. The moulds according to the invention are formed in two half shells of cast iron, varying in size so as to be capable of holding the pipe about to be cast therein.

"The workman when making a loam or sand mould uses those materials in a damp state, and of the ordinary kind, and he  
"plasters the loam with his hands on the interior of the half  
"shells, and then by means of the sweep board or profile he  
"causes the interior of the mould to take the correct form by  
"moving the sweep board on its axis within a half shell; and  
"when the interior of the mould is thus completed with care,  
"the same is to be dried in an oven, such as is used when making  
"dry cores; and when the mould is dried the upper edges are  
"carefully removed, so that when the two halves of the mould  
"come together they shall make a good joint. An ordinary dry  
"core is then placed in the lower half shell . . . and the upper  
"half shell is then placed on to the lower one, and the two  
"are fixed together by means of bolts and keys or cotters, . . .  
"a 'runner' or 'git' is then formed; . . . the casting may then  
"be made. After the casting has been removed, the two parts of  
"the mould are to be examined, and if injured in any part or  
"parts, they are to be repaired by the workman, and then blacked  
"over again and dried, and a fresh core is to be placed therein,  
"and another casting made, and so on as long as the mould  
"lasts."

[Printed, 6d. Drawing. See Repertory of Arts, vol. 4 (*enlarged series*), p. 289; Engineers' and Architects' Journal, vol. 7, p. 370.]

A.D. 1844, March 28.—N° 10,122.

HARDY, JAMES.—This invention relates to the manufacture of welded iron tubes from skelps, the edges of which may be pre-



vously turned up by any of the known processes. The welding apparatus consists of three grooved rollers, in contradistinction to the two grooved rollers formerly employed in conjunction with a mandril and contiguous to a furnace by Henry Osborn, whose patent, dated March 1, 1817, No. 4105, is referred to and described.

The three grooved rollers, according to the present invention, are horizontally disposed one above another, their axes or spindle ends resting in appropriate side frames, so that in practical effect the three rollers act as two pairs, the middle roller engaging independently by turns with the other two, viz., with the roller below at the first pass between them of the heated skelp from the front to the back of the machine, and with the roller above for the return pass of the skelp from back to front.

The heating furnace is placed in front of the machine, in order that the skelps as they are withdrawn at the proper welding heat, may move in a direct line towards the grooves in the rolls, wherein lies, exactly between the rolls, the bulb of a long mandril having the extreme back end of its stem rigidly fixed to a stopping frame. This mandril receives the skelp or newly welded tube, which is forced by the grip of the rolls as it enters between them, over the bulb of the mandril on to its stem, which rests in an adjustable semicircular trough, that by means of levers, so soon as the tube has passed out from between the rollers on to the mandril stem and the back end of the latter is free, carries the mandril and tube upwards to the level of the grooves between the middle and top rollers, and presents it to the proper groove, their grip as the returning tube passes through them drawing it off the mandril over the bulb. By this means the tube is welded and brought into form, the bulb of the mandril determining the size and circularity of the bore as the tube is forced over it on to the mandril at the first pass between the bottom and the middle rollers, and is drawn off it at the return pass between the middle and the roller above, the grooves in the latter being a shade less deep than the grooves in either the middle or the bottom roller.

[Printed, 1s. 4d. Drawings.]

A.D. 1844, July 24.—N° 10,272.

RUSSELL, JOHN JAMES, and RUSSELL, THOMAS HENRY.  
—The object of this invention is to improve the machinery employed for welding the seams of wrought metal tubes. The

skelp or unwelded tube, heated to a welding heat, is laid in a groove or hollow formed longitudinally in the upper surface of a long travelling table, that is caused to move on a carriage in alternate directions along the bed rails or frame of the apparatus, beneath a welding roller which is mounted directly above, and is grooved to correspond with the curve of the upper surface of the tube, and by pressure thereon as the latter moves to and fro beneath it, the welding of the seam of the tube is effected. This system of working is more particularly adapted to the welding of tubes large in diameter, and consequently of considerable weight. When a mandril is used to support the tube internally, a part of the end of the latter is turned down by a lever, so as to catch in a recess formed in the end of the table, and thereby enable it to hold against the pinch of the roller, and to drag itself over the enlarged end of the mandril, the opposite end of which is rigidly fixed to the framework of the apparatus. The to-and-fro movements of the carriage are effected by means of a coarse pitched screw, which is driven by reversing gear, the change taking place at each end of the traverse of the travelling table. When the seams of tubes with butt joints are welded, no mandril is required.

[Printed, 1s. 8d. Drawings. See Repertory of Arts, vol. 5. (*enlarged series*), p. 231; and Artizan, vol. 4, p. 67.]

A.D. 1844, November 5.—N<sup>o</sup> 10,380.

THOMAS, JOSEPH.—(*A communication.*)—This invention relates to the manufacture of tubes of wrought metal, which is drawn cold into the tubular form, and (as described by the patentee) may be either single or double, “that is to say, the finished tube may consist of one piece of iron, turned up and united at the edges, or of an internal and an external tubular shell, each shell being united at the edges and at the circumference, and the one within the other. A band, strip, or plate of iron, of a size and thickness varying according to the tube required is taken, and the two sides being turned up (an embracing strip or clasp of iron being sometimes introduced,) the edges are brought together, united, clasped, and drawn cold by suitable machinery through dies.”

The draw-bench or apparatus employed is of the same kind as that ordinarily constructed for the purpose. Tubes so made may be immersed in a bath of tin or galvanized, according to



the nature of the metal of which they are composed, the result being a solid straight tube, whether two tubes be employed, or a single tube with the edges of the joint or seam turned either inward or outwards and secured by a longitudinal clasp. Thirteen different examples of these tubes in transverse section are described and illustrated.

(Printed, Ed. Dredger.)

A.D. 1845, March 8.—N° 10,546.

SELBY, GEORGE.—This invention, relating to the manufacture of wrought iron welded tubes, consists in:—

1st. The preparation of the skelps or long narrow wrought-iron plates, which are severally taken at a red heat from a furnace and directly presented to and passed between a pair of rollers, which turn up the two edges of the skelp and force it on between two fixed cheeks, which have the effect of bending it along the center, and press the edges over towards each other; thence the skelp passes between two grooved rollers on to a stationary mandril which has an enlarged end that lies in the grooves directly between the rollers and passes into the skelp, which assumes a tubular form.

2nd. The welding process, which is effected by four disc rollers with grooved peripheries that meet at a common center, and collectively form a circular opening or die, there being the enlarged end of a fixed mandril projecting into the opening from the back of the machine, and in front the skelp at a welding heat is presented to the opening between the rollers through a bell-mouthed guide piece, which is furnished with four scrapers that remove all the scale and scoria from the surface of the skelp as it is drawn on by the rollers and forced over the enlarged end of the mandril on to its stem.

3rd. Removing or shaving off by means of suitable cutters disposed at the back of the welding rollers, any fins or feathers formed on the welded tube at the angles where the edges of the rollers meet.

4th. Arranging a furnace with a door at each end between the two-roller skelp bending machine and the four-roller welding machine, so as to be able conveniently to serve both machines.

5th. Applying a mouthpiece for guiding skelps heated to a welding heat between two grooved rollers, so as to ensure that one of the rollers presses directly upon the seam.

6th. Straightening pipes or tubes after the welding process, and whilst hot, by an apparatus which stretches them longitudinally, in which position they are kept until they cool.

7th. An apparatus of the nature of a turning lathe, designed for cutting off or trimming both ends of finished pipes simultaneously.

[Printed, 3s. 10d. Drawings.]

A.D. 1845, April 15.—N° 10,621.

ROYLE, GEORGE.—This invention relates to the manufacture of tubes adapted to locomotive, marine, steam, gas, and other purposes, and consists in forming such tubes from skelps, the object being by means of rollers and grippers or other dies, to effect the closing and welding of the seam, and the rounding, smoothing, and finishing of the tube, before the metal when once heated has time to cool, the skelps being heated, and by the ordinary bending machine previously brought into the tubular form, so that the edges of the seam meet or overlap. The heating of the bent skelp is effected in an air furnace of sufficient size to raise the skelp to a welding heat throughout its whole length, and in this state either upon a mandril or otherwise it is presented to the rolling machine, which consists of two rollers horizontally mounted in suitable side frames. Each roller is furnished with a series of six semicircular grooves, graduating in size from the largest at one end to the smallest at the other, so that when the rollers are placed in position one upon the other, the several grooves in each correspond and form a series of circular openings of gradually diminishing size. The heated skelp is first passed between the grooves forming the largest opening, and then immediately through the next in size and so on, and when the seam is properly welded and the tube rounded, it is taken to a draw-bench, and either dragged through a pair of gripper dies which scrape, smooth, and finish it, or it is drawn through a solid die, the choice of dies depending mainly upon the nature and quality of the iron.

[Printed, 10d. Drawing. See *Mechanics' Magazine*, vol. 43, p. 337.]

A.D. 1845, May 1.—N° 10,649.

PROSSER, RICHARD.—This invention, relating to the successive processes employed in the manufacture of wrought metal welded tubes and to the machinery and apparatus employed, consists in:—

1st. Cutting and shaping by means of circular shears and cutters the edges of the narrow plates or skelps previous to their being turned up or bent into the tubular form, and preparatory to welding. Two modes are described; according to one method one edge of the plate is double bevelled or V-formed, and the other edge is V-grooved, so that one fits into the other when the edges come together; and by the other method the two edges are rabbetted, one on the upper side and the other on the under side, so that when brought together they form a half lap.

2nd. Turning up the edges of the skelps by means of trough-formed moulds and correspondingly formed presser dies operated by hydraulic or other pressure. The first stage of the process turns up the edges of the skelp, the second turns them over, and the third, by means of two semi-circular moulding dies, closes them and imparts to the skelp a tubular form.

3rd. Fastening together the edges of tubular skelps by inlaying double dove-tailed cramps into corresponding double dove-tailed notches cut in the two edges of the skelp, and welding a short portion of the ends of skelps preparatory to heating and welding the whole length.

4th. Introducing skelps into furnaces by means of a long bar and other contrivances which deposit the skelp easily in a horizontal position on the heated bed of the furnace; and when heated to a welding heat throughout its whole length, withdrawing the skelp through a door at the opposite end of the furnace, the skelp, to prevent its bending as it leaves the furnace, being supported by a grooved roller and gently pushed forward by a rod at the back end.

5th. Welding the edges of tubular wrought iron skelps by passing them (when taken from the furnace at a welding heat) through grooved rollers co-operating in combination with a pair of grooved guiding cheeks, which in case of necessity are capable of lateral yielding, the rollers having (if preferred) an alternate forward and backward motion, so that the skelp may be passed and returned, the rollers and cheeks operating in both directions.

6th. Relates to the welding by means of rollers only one half or a portion of the length of a skelp at a time, the rollers having sunken places for passing in the tube, are caused to turn a single revolution only in either one or both directions.

7th. "Preparing the ends of welded iron tubes for being welded together end to end, in continuation of length, by forming a

“ vee groove around one of the two ends which are to be welded together, and forming a double bevil around the other of those ends, which vee groove and double bevil will fit true one into the other, and then fastening together the two ends which are so fitted by inlaying double dovetailed cramps into corresponding notches cut out in the two ends; and after being so prepared, the joint to be heated and welded, by hammering or otherwise.”

8th. Cleaning and smoothing the surfaces of metal tubes by placing a number of them lengthwise in a horizontal cylinder. When the latter revolves on its axis, the tubes roll over and rub against each other, and by this means their external surfaces are cleaned and made smooth; and inside each tube is placed a metal rod, whereby at the same time they are cleaned and smoothed internally.

9th. Straightening and making tubes truly cylindrical by laying them in a heated state between rollers in the direction of their length, the rollers revolving in one and the opposite direction alternately, the ends of the tube being supported by an angular trough at each end of the machine.

10th. Mounting rolling machines on base frames supported on wheels adapted to run on horizontal rails, in order that such machine may when required be capable of removal for repairs or otherwise.

11th. Relates to the process of grooving the rollers employed.

12th. Cutting or severing tubes or the ends of tubes by means of cutting tools; the tube under operation is fixed and the cutting tool which revolves round the tube, is carried by a slider that advances mechanically, and gradually cuts into the tube. By means of this apparatus both ends of a tube are cut off at the same time.

13th. Relates to the fixed mandril employed in the process of rolling tubes, the head of which mandril instead of being, as is usually the case, solid, is made cup-formed and collapsible, so that it will yield in case of accident from sticking fast or clogging, and thereby avoid breaking the gearing or other parts of the machinery.

[Printed, 4s. 10d. Drawings.]

A.D. 1845, May 6.—No 10,654.

FOREMAN, JAMES.—(*A communication.*)—This invention relating to the manufacture of wrought metal tubes or pipes for



railway purposes, and also for the conveyance of water, gas, and other fluids, consists in forming such pipes and tubes in curved longitudinal sections, bent to the required angle at the edges to form flanges, which when rivetted together radially project externally along the pipe. In some cases (according to one example shown and described) a pipe is formed out of a single narrow plate or band, gradually brought to a cylindrical form with its marginal edges turned or bent to a right angle outwards by drawing it either in a heated or cold state through a succession of dies, the flanges being afterwards rivetted together and made fluid tight. Some examples shown consist of two longitudinal sections and consequently have two projecting ribs formed by the flanges, one on each opposite side; other examples are shown formed by three sections, and others with four, the four longitudinal ribs or flanges projecting radially from the four opposite sides relatively  $90^\circ$  apart. When the tubes are composed of two or more sections, instead of drawing the metal pieces into sectional form by means of dies or draw plates, the process of rolling may be resorted to.

Tubes of wrought iron applicable for atmospheric railways, are constructed by connecting and rivetting together in the same way, two or more longitudinal sections previously brought to the required form, two of the meeting flanges being left apart to form the two sides of the longitudinal slit or opening, through and in which the part that connects the carriages to the piston passes and moves along.

The end flanges when used for connecting these pipes are made of wrought iron, heated and shrunk on, and secured by any convenient means; other modes of connection may be adopted, and to prevent oxidation, the pipes may be coated with zinc by the galvanizing or other methods in use.

[Printed, 8d. Drawing.]

A.D. 1845, June 3.—N<sup>o</sup> 10,696.

WHITEHOUSE, CORNELIUS.—This invention relates to the construction of welding and hammering machinery, adapted to the manufacture of gun barrels and other tubes. The machine first described, adapted to weld the lapped longitudinal seam of gun barrels and tubes, operates by means of revolving hammers mounted on the end of a hammer shaft, to one end of which is imparted a compound motion. This shaft is longitudinally con-



nected to the driving shaft by a universal joint at one end, so that the other or free end carrying the hammers is free to rise and fall whilst revolving, which has a combined drawing and hammering effect on the joint of the tube under process of being closed. When cylindrical tubes are being closed, the striking surfaces respectively of the anvil and of the hammer are concave, and in the case of square tubes they are flat, the tubes in both cases being worked on mandrils of suitable form.

The machine employed to weld twisted gun barrels and tubes, or such as are composed of a number of short tubes and have their seams running crosswise, operates by means of a pair of long pressing dies or swages, which are held on fixed studs at one end, and are caused to close upon the tube, when the latter is heated to a welding heat and placed directly between them on a suitable mandril by strong screws. These dies embrace the whole length of the tube, which whilst pressed upon laterally by the dies, is forced endways by the screw that operates the crosshead to which the mandril is attached.

The finishing of tubes is performed by pressing rollers or by bell-mouthed dies, and dies, which operate externally upon the tube. During the operation the tube is supported internally upon a mandril, that has an enlargement at one part to equalize in conjunction with the rollers the internal size of the tube, when it is forced or drawn through by a screw.

[Printed, 1s. Drawings.]

A.D. 1845, June 5.—N<sup>o</sup> 10,710.

**HARDY, JAMES.**—The object of this invention, relating to the manufacture of welded tubes, is to effect the welding and rolling before the skelp whilst heated to the welding temperature has time to cool. In the machine employed are mounted horizontally, in parallel position one above the other, two rollers, which are furnished with a series of corresponding semi-circular grooves, respectively graduating in size from the largest at one end of the rollers, to the smallest at the other. These rollers act whilst turning in either direction, for which purpose they are driven by reversing gear, consisting of a sliding clutch that engages with either of two mitre wheels which are driven in opposite directions by an intermediate mitre wheel, the two wheels being free to revolve upon one end of the axis of the bottom roller, the clutch sliding on the axis between them, its driving teeth engaging with them alternately according to the direction of motion required.

The machine is furnished with a series of mandrils, which abut against a stop frame fixed a suitable distance from the machine, the direction of the mandrils being coincident with the grooves in the rollers, their free ends which are oviform, reaching to between the grooves of the rollers and terminating there.

The skelp taken at a welding heat from the furnace is immediately presented to either one or other of the largest of the grooves best suited to its size, and is immediately drawn by the grip of the rollers through them, and forced upon the mandril rod, which is then slightly turned on its axis and immediately returned through the same groove, the motion of the rollers being reversed; in this way the tube is welded by the first or second passes, and any inequalities on its surface are reduced. If required it may in like manner whilst heated be passed through the other smaller grooves in rotation, thereby to reduce its diameter and substance and increase its length. The inventor says "I am enabled to weld and make both lap and butt-joint tubes or pipes with equal facility, and also to weld, form, and make tubes or pipes from spiral strings or narrow strips of twisted metal."

[Printed, 6d. Drawing. See London Journal (*Newton's*), vol. 28 (*conjoined series*, p. 22.)]

A.D. 1845, July 21.—N° 10,779.

BRETT, JACOB.—(*A communication.*)—This invention relates to a system of railway propulsion, operating by means of compressed air, and to the manufacture of the tubes and junctions.

A description of that part of the invention which refers to the system of atmospheric propulsion, will be found in the series of Abridgements relating to Railways.

With regard to the tubes employed, which are also applicable for water, gas, and other purposes, it consists, first, in manufacturing such tubes "of sheet iron or metallic plates combined with mastics, or coated with bitumen, resinous, asphaltic, sulphurous, or composite fat bodies, mixed with pulverized matters, so as to preserve the tubes from oxidation, and give a greater consistence and strength to them. Second, an apparatus for melting and distilling the bituminous matters, and the manufacturing of the mastics in general. Third, for the screw heads of cast metal connected and soldered on the sheet-iron tubes by means of moulds, and run in at one casting. Fourth, for a system of screw heads practicable to sheet-iron tubes, or to metallic plates, either by pressure between two grooves or fluted

" cylinders, or by percussion between two grooved matrixes.  
" Fifth, for a machine to form the shoulders or collars of the tubes  
" by means of two cylinders. Sixth, for a machine to curve the  
" sheet iron, and form the tube of small diameter. Seventh, for  
" a cutter with a matrix to cut the dovetails uniform, and to  
" pierce two parallel holes in the tubes, after they are formed into  
" cylinders, which facilitates the work of the longitudinal joint of  
" the metal tubes. Eighth, for a machine adapted for applying  
" the mastic or bitumen, on the metal tubes, and to cool them  
" during the operation."

The machine for curving or bending the sheet metal into the form of tubes, operates by means of two pairs of disc wheels or rollers mounted on axes which revolve in suitable bearings. The periphery of one of the discs of the first pair which operates is grooved, and the periphery of the other is rounded, so that when the sheet of metal is passed between them longitudinally, it is bent into a trough-like form. Both rollers of the other pair of discs have their peripheries grooved, and these grooves form a perfect circle when the edges of the two discs are brought together, and they complete the tubular form of the plate when it is passed between them on a mandril, which is afterwards withdrawn. The edges of the tube are united by a series of dovetails, which are cut out by a punching apparatus, similar in its principle of action to a fly press; the joints are afterwards soldered. A socket or shoulder is next formed on one end of each tube by means of two long rollers or arbors, preparatory to the casting on the ends of the tubes a screw coupling, for which purpose suitable mandrils and moulds are employed. The union screw threads may otherwise be formed on the ends of the tubes by a machine which acts by pressure and percussion.

The remainder of the invention relates to coating the tubes externally and internally for the purpose of preventing oxidation, with resin, asphalte, caoutchouc, or any other bituminous or oily substance.

[Printed, 6s. 6d. Drawings.]

A.D. 1845, August 14.—N<sup>o</sup> 10,816.

RUSSELL, THOMAS HENRY.—This invention relates to the manufacture of welded iron tubes. The tubular skelp, drawn from a furnace at a welding heat is placed upon a mandril or what the inventor terms a "beak iron," which has a working surface of

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steel and is rigidly fixed at one end in a horizontal position, its free end projecting over a draw-bench. The free end of this beak-iron affords the necessary resistance and support when the lap joint of the tube, in order to weld it, is pressed upon by a roller whilst the tube is drawn off the beak-iron by the action of the draw-chain, to which the grippers that have hold of the tube are attached. This system of working answers for tubes of large size, which are welded thereby at two operations, one half at a time. In making small tubes, the mandril or beak-iron is required to be longer and of small diameter, and consequently as it has not sufficient substance to support the tube and its own weight horizontally without deflection, it is supported by a roller beneath the tube whilst the welding roller above is operating upon the seam, the draw-chain dragging the tube forward, the skelp in this case being drawn direct from the furnace on to the beak-iron.

[Printed, 2s. 8d. Drawings. See Repertory of Arts, vol. 8 (*enlarged series*), p. 65.]

A.D. 1845, September 26.—N° 10,840.

NEWTON, ALFRED VINCENT.—(*A communication.*)—The object of this invention, which relates to the construction of apparatus operated by hydraulic pressure and adapted to the manufacture in continuous lengths of lead pipes, is during the process of manufacture to line such pipes with an internal coating of tin. So far as regards the production of the leaden pipes, the apparatus commonly in use is employed, the lead in a fluid state being forced from a containing chamber through an annular space or channel formed between a circular die and a concentrically fixed mandril. This mandril for the purposes of the invention is made hollow, whence lateral passages open into an external annular recess, the cavity in the mandril being in communication with a chamber attached to the apparatus containing the molten tin. Before the newly formed lead pipe is forced off the end of the mandril, it passes over the annular recess, into which the tin continues to flow through the internal passages, and being brought into contact with the internal surface of the pipe, it attaches itself thereto, forming a coating the thickness of which is regulated by the size of the end of the mandril, which smooths the surface of the tin as the lead pipe is forced off.

[Printed, 10d. Drawings. See London Journal (*Newton's*), vol. 29 (*continued series*), p. 18.]

A.D. 1845, December 5.—N° 10,981.

**BESSEMER, HENRY.**—This invention relates, 1st., to the use, for exhausting the main tube of atmospheric railways, of a steam engine and air pump disposed in a direct line, so that one piston rod carries both pistons. 2nd. Regulating the working of the slide valves. 3rd. A combined rotary air and steam engine. 4th. Applying "air fanners" to rotary engines, the same being worked direct by the engine shaft. 5th. Relates to the longitudinal valve of the atmospheric traction tube. 6th. To the sealing and re-sealing the valve.

The last part of the invention relates to the construction of the core bars employed to form the interior or tubular cavity of pipes, railway tubes, and hollow columns, the object being to avoid the use of the hay bands which are usually employed to lap the core bar and support the external coating of loam, and which frequently gives way under the pressure, when the metal is poured into the mould, and as a consequence spoils or alters the internal form of the casting. To remedy this the hollow core bar is externally furnished with a series of projecting rings, disposed at intervals throughout its whole length to support a covering of wire gauze, or one of thin perforated sheet metal, either of which in lieu of the hay bands may be used to support the outer covering of loam, and form a series of interspaces between the projecting rings, so that the air which, during the process of casting is forced through into the hollow of the core bar, has a free passage to escape, whilst the true external form of the core is duly maintained.

[Printed, 2s. 2d. Drawings. See Practical Mechanics' Journal, vol. 4, p. 122.]

A.D. 1846, March 25.—N° 11,149.

**SMITH, CHARLES.**—This invention is multifarious in its objects, and relates to a great variety of articles and things for domestic and other uses. Amongst the articles enumerated and which belong to this series of Abridgments, there is under the fifth head of the invention, a fender, which is so contrived as also to serve the purpose of a fire-guard. Within the upright front of the fender are fitted one, two, or more slides which, when down are level with the fender top, but when lifted and secured by spring catches, they effectually guard the fire; when not required for that purpose, the catches are pushed back and the



slides descend. Under the seventh head of the invention, amongst the articles and processes therein enumerated, is a method of lining iron pipes with other tubes of earthenware or glass, and also a mode of applying enamel to the internal surface of iron pipes, with a view to prevent oxidation. Inside the pipe (which is previously cleaned) is inserted an apparatus comprising a long gutter or trough, which has projecting from its underside, a row of bristles, forming a brush that extends from end to end of the pipe, and in contact with its inner surface. This apparatus is provided with an axis which projects from each end of the pipe, and resting in suitable bearings, is capable of being turned by a handle. The enamel (about the consistence of cream) is poured into the trough, which when the handle is turned is upset and the enamelling substance is deposited in the pipe, and evenly distributed by the brush over its internal surface. The apparatus is then withdrawn, and the pipe is placed in an oven where the enamel is burnt on in the usual way. If the first coating is not sufficiently thick the operation may be repeated.

The glass and earthenware tubes employed for lining iron pipes, are smaller externally than the bore of such pipes, so that when a tube of glass is placed upon a mandril and inserted in an iron pipe, a thin annular space is formed between them; this space is to be filled with hot liquid pitch, cement, or any other suitable substance, or composition that will afterwards solidify.

[Printed, 3s. 6d. Drawings. See London Journal (*Newton's*), vol. 29 (*continued series*), p. 356; Rolls Chapel.]

A.D. 1846, May 5.—N<sup>o</sup> 11,197.

CHURCH, WILLIAM.—The first part of this invention relates  
“to peculiar constructions or arrangements of stamping machinery suited to the formation of a variety of articles of the dish  
“or shallow pan kind, too numerous to be particularly described,  
“such, for instance, as the dishes or pans for candlesticks, and  
“also dishes, pans, or shallow vessels to be made from metal for  
“a great variety of other uses, and which said improved machinery is likewise applicable to the beating of bars, plates, or  
“pieces of metal for welding, embossing, medalling, flattening,  
“straightening, and otherwise forming metal into shapes for an  
“innumerable variety of useful purposes.”

The second part "applies to certain constructions or arrangements of machinery by means of which I am enabled to bend up and connect the edges of plate metal so as to produce a variety of tubular forms suited for the making of sockets for candlesticks and other tubes and tubular articles of different kinds, either cylindrical, conical, or of other shapes applicable to many useful purposes." These tubes and tubular articles are made of sheet metal cut to the required form and size, and brought into a cylindrical shape by machinery, in which the compressing power is obtained by the act of straightening jointed levers, and in which dies of the size and form suited to the work, and corresponding mandrils are employed. The plates are first brought into the cylindrical form, and the edges are afterwards lap-jointed by welding, for which purpose the tubes are heated to the required temperature in a suitable furnace, and thence being taken and placed on the end of a mandril, the joints are operated upon by dies. Hollow rails for railway purposes are formed in a machine by the action of dies, the plates being previously heated. In carrying on the process of welding the seams of tubes, it is necessary immediately after the operation is finished before the metal is allowed any time to cool that the mandril be withdrawn, otherwise if the metal be previously allowed to cool and contract, the mandril will become fixed and immovable. The arrangement of the dies and the machines are modified to perform different operations according to the description and nature of the work required.

[Printed, 4s. 6d. Drawings. See Patent Journal, vol. 2, p. 717.]

A.D. 1846, July 14.—N<sup>o</sup> 11,296.

STEWART, DAVID YOOLOW.—This invention relates to the construction of the moulds employed for casting pipes and other cylinders, whereby (it is stated) "much of the labour heretofore necessary for ramming the sand will be saved, and at the same time the errors of constructing moulds for such purposes, which are consequent on having the moulds made in separate parts, will be avoided, and moulds of very great truth and accuracy will be obtained."

The mould box vertically disposed, is made (by preference) in two longitudinal halves firmly held together by annular straps and keys; the pipe pattern is placed plain end downwards inside

a tubular presser, that is introduced at the upper end of and lowered into the mould box by means of a crosshead sliding vertically between two upright guides, one of which revolves. At the extreme end of the presser are two or more projecting helical presser blades, and there are other projections above for loosening or preventing any lodgment of the moulding sand, which is thrown in at the top or socket end of the mould box. The tubular presser is caused to revolve by a spur wheel on its upper end actuated by a pinion which has liberty to slide lengthwise on the guide which revolves, which guide being a square bar, when rotated by the driving power, carries the pinion round. The moulding sand being thrown in at the top of the mould box, is as it falls pressed down by the helical blades on the lower end of the revolving presser, which as the mould box fills gradually rises and leaves the pattern in the sand. The pattern is afterwards raised and withdrawn, and auxiliary pattern pieces are employed to form by hand the sockets or flanges as the case may be.

[Printed, 8d. Drawing.]

A.D. 1846, August 29.—N<sup>o</sup> 11,360.

ROOSE, JAMES.—This invention relates to the manufacture of welded iron tubes direct from the flat plate or skelp, which is drawn out of the furnace, turned up, made tubular and welded at one operation of the machinery, there being the bulb of a mandril to support the tube internally, and an air blast (either hot or cold) directed upon the seam as it enters between a pair of welding and shaping rollers. After the edges of the plate have been chamfered to lap together obliquely, the two corners of one end are turned up and lapped one over the other, so as to make that end smaller in diameter than the intended size of the finished tube. The plate thus prepared is placed in the furnace, and when at a welding heat it is drawn forward, and the turned end is passed through a bell-shaped mouth-piece placed directly in front of the grooves of a pair of welding and shaping rollers, and introduced sufficiently between the grooves of the rollers to be gripped on the other side by the pliers, or secured to the conical end of a draw-rod which is attached to the chain of a draw-bench disposed at the back of the rolls and in a direct line therewith; the chain *of the draw-bench* being then set in motion, the skelp (as de-



scribed by the inventor) "will be drawn through the bell or mouthpiece, and owing to the ridge on the bell or mouthpiece, the one edge of the skelp will be caused to overlap the other edge, and when the skelp has left the bell and it is in the pinch of the rolls, the place of contact with the rolls being the point which gives the welding pressure, the mandril being within and offering resistance to the internal part of the tube. Between the back part or small end of the bell and the entrance of the rolls I have fixed a pipe or tube, through which there is conveyed either hot or cold blast, blown by the engine or other mechanical means; the end of this tube is fixed over the seam or joint of the skelp or tube. The blast will have the effect of producing the metal at the seam or joint into a partly liquid state or state of fusion. The rolls revolve by machinery and traverse at the same surface speed as the chain on the draw bench, so that the draft on the tube is eased, and the draft has not the tendency to stretch the tube more in one place than another, nor to pull the tube in two. The mandril is placed in front of the bell or mouthpiece, the bulb protruding through and into the groove of the rolls. By this process the skelp with the one end turned up is produced at one heat and at one operation into a lap joint welded iron tube."

When the skelps are heavy, the draw-rod is passed between the rolls, through the bell mouth-piece and into the turned up end of the skelp in the furnace, and the skelp is drawn out by it, and dragged directly through the mouth-piece and the rolls.

[Printed, 1s. 4d. Drawings. See Repertory of Arts, vol. 9 (*enlarged series*); p. 257; Patent Journal, vol. 2, p. 685; and Engineers' and Architects' Journal, vol. 10, p. 179.]

A.D. 1846, September 17.—N<sup>o</sup> 11,377.

**PALMER, WILLIAM.**—This invention relates to apparatus applicable to lamps, and to ornamental tubular pillars adapted thereto and other purposes; also to pipes for conveying liquids and gaseous fluids. These pillars and pipes consist of two pipes combined, one of glass disposed within the other tube which is of metal. When used for ornamental purposes, the glass pipe or pillar forms the outside, and the metal pipe or tube, which is so much less in diameter as to leave an annular interspace between them, the inside; this space is filled with plaster of paris or other cement; the cement is seen through the glass, and when

colored or the interior of the glass tube is grained or ornamented, various pleasing effects may be produced. When tubes are made for conveying liquids, the metal tube forms the exterior. Provision is made for preventing the outflow of the cement, which is introduced in a liquid state, and when the ends of such tubes and pillars are connected, a wrapping of cotton saturated with bees wax softened with oil, is lapped round the end of the inner tube, and a collar or union of glass or metal is slid or screwed over the junction.

[Printed, 1s. 8d. Drawings. See London Journal (*Newton's*), vol. 32 (*continued series*), p. 170; Patent Journal, vol. 2, p. 714.]

A.D. 1847, June 3.—No 11,728.

JENNINGS, JOSIAH GEORGE.—This invention relates to the construction of valves adapted to water-closets, and to making the joints and connecting pipes made of soft metal or flexible material, to each other, or to pipes or vessels made of rigid or hard metal.

For the purpose of jointing two leaden pipes, the ends to be united are beaten or jumped up to form a flange round each; a ring or ferrule, screw-threaded externally and somewhat thicker than the projection of the flange, is then slid on to the plain end of one pipe up to the back of the flange, and up to the back of the flange on the other pipe is slid an internally screwed annular cap which engages with the screwed ring on the other pipe, and when turned draws the end faces respectively of the two pipes together, there being a washer of leather or other suitable material intermediately disposed between them.

A pipe of leather, gutta percha, or other flexible material, is connected to a metal pipe in the following manner:—Near the end of the metal pipe there is an enlargement screw threaded externally, and thence to the end the pipe is dome formed or contracted to a smaller diameter. This diminishing end is forced into the flexible pipe, and then a union cap, corresponding internally with the form of the end of the metal pipe is screwed on, so as to nip and secure the end of the flexible pipe between the end of the metal pipe and the cap.

For the purpose of connecting a flanged metal pipe to a leaden pipe, an internally screw-threaded ring is inserted in the end of the leaden pipe, which is opened out to receive it and then beaten up so as to close it against the outer end of the ring and form an



internal flange; an externally screw-threaded prolongation on the metal pipe is then screwed into the ring, a washer of leather or other suitable material being interposed and compressed between the end surfaces respectively of the flange on the metal pipe and the internal flange which encloses the ring on the end of the lead pipe.

Two metal pipes with shallow flanges are connected by means of two rings, one of which is furnished with two projecting pieces which pass through openings in the other ring; the two rings are drawn together by cotters, a suitable washer being interposed between the ends of the two pipes.

A method of connecting a pipe to a vessel by means of catches or tongues is also described.

[Printed, 1s. 2d. Drawings. See Patent Journal, vol. 4, pp. 51 and 60; vol. 6, p. 222; and vol. 8, p. 160.]

A.D. 1847, September 9.—N° 11,868.

MORGAN, DAVID and JENKINS, JOHN BORLASE. — This invention is entitled "Certain improvements in the manufacture of copper and other metal cylinders or rollers for the printing of silks and other fabrics and for other similar purposes, and in casting copper and other metal cylinders, tubes or rollers hollow and free from air bubbles."

[No Specification enrolled.]

A.D. 1848, January 13.—N° 12,021.

CUTLER, JOB and ROBINSON, CHARLES.—This invention relates to the manufacture of welded iron tubes and pipes, adapted for use in the construction of tubular steam boilers, the object being to produce a tube suitable for the purpose which shall be uniform in size throughout its length externally, but tapering internally, so that its bore will be larger at one end than the other, and consequently the substance of the metal of the tube will be thicker at the smallest end of the bore. The strongest ends of these tubes are intended to be placed contiguous to the boiler furnace, as they are capable of enduring the greatest amount of wear and the fiercest heat, and they gradually become thinner towards their outer ends, and therefore more readily capable of absorbing and conducting to the water the attenuated heat of the hot draught.

The apparatus employed for the welding process consists of a series of pairs of grooved rollers, respectively mounted in suitable side frames and disposed at equal distances apart in a direct line leading to a draw-bench. The skelp is prepared for lap jointing and welding in the usual way, and taken at a welding heat, is presented to the circular groove formed by the two rollers of the first pair, between which reaches the enlarged end or bulb of a tapering mandril, the opposite end whereof extends in the direction of the second pair of rolls, and is fixed abutting against a stopping frame or rest. The skelp whilst passing between the rollers of the first pair is welded and driven on to the tapering rod of the mandril, and it is immediately passed in succession with the mandril inside it through each pair of rolls in the series, the grooves in the second pair being smaller than the first, the third pair smaller than the second, and so on up to the draw-bench, which is used for drawing the mandril out of the tube. By this means the tube is welded and reduced to form at one heat. Instead of employing the draw-bench for extracting the mandril, it may be loosened by the rolling pressure of three rollers trigonally disposed and relatively parallel, the tube and mandril occupying a central position between them in the direction of their length; and instead of a series of pairs of rollers, dies and tongs may be employed to produce a parallel tube with a tapering bore.

[Printed, 10d. Drawings. See *Mechanics' Magazine*, vol. 49, p. 54; *Patent Journal*, vol. 5, p. 193; and *Engineers' and Architects' Journal*, vol. 11, p. 248.]

A.D. 1848, March 22.—N° 12,100.

NEWTON, WILLIAM EDWARD.—(*A communication*).—This invention relates to an apparatus designed for connecting or coupling together the ends of pipes. Both ends of each pipe are formed with a flange projecting more or less, after the manner of what are known as flanged pipes. The back edge of each flange is so chamfered or cut away, that when the end meeting surfaces of two pipes are brought into position for coupling, their respective flanges come together face to face and their combined outer surfaces form a V-shaped angular projection. A collar grooved internally to correspond and made in two semicircular parts or halves, embraces the projecting edges of the two flanges, and when they are drawn together by nut bolts, the sides of the groove in the collar impinge upon the chamfered edges of the flanges, and

have the effect of drawing them together. When the meeting surfaces are not level or true, an intermediate packing may be used, and if thought desirable a short tube may be placed, one half its length in the end of each pipe to keep them in position.

According to a modification the projecting periphery of the flanges is left square, and two chamfered rings are used, one at the back of each flange; the sides of the groove in the collar, instead of as in the former case acting direct upon the two, flanges, impinge upon the inclining or chamfered edges of the rings, which are thereby forced against the flanges of the pipes and by this means their respective meeting surfaces are pressed and held together in fluid-tight contact.

[Printed, 16d. Drawing. See London Journal (*Newton's*), vol. 34 (*conjoined series*), p. 79; Repertory of Arts, vol. 13 (*enlarged series*), p. 302; Mechanics' Magazine, vol. 50, p. 224; Artizan, vol. 7, p. 134; Patent Journal, vol. 6, pp. 214 and 218; Engineers' and Architects' Journal, vol. 12, p. 118.]

A.D. 1848, April 10.—No 12,114.

POTTS, THOMAS.—This invention relating to the manufacture of the copper flue tubes of locomotive and other steam boilers, refers to the grit which passes through with the hot draught, and damages them internally; this is avoided by a method of lining such tubes with "what is called 'Bath metal,' compounded of  
 " three parts of best selected copper, two parts of foreign zinc,  
 " and ten ounces of refined tin, for every hundredweight of the  
 " Bath metal, rolled out into a plate or strip, which I form into  
 " a tubular shape of the size required in the ordinary manner of  
 " making tubes, the edges butting together, and I anneal such  
 " tubes and stretch them in order to straighten them and that  
 " the edges of each plate may come correctly together. On  
 " each of these tubes I place by preference a tube of copper, but  
 " it may be of an alloy of copper, the outer tube going readily on  
 " to the inner or lining tube. The compound tube thus prepared  
 " I put on to a taper mandril of steel with a taper of about one  
 " sixteenth of an inch in its length, which not only facilitates the  
 " withdrawing of the mandril, but also gives additional thickness  
 " to the end of the tubular flue which comes next the fire-box of  
 " the steam boiler. These compound tubes are then drawn with  
 " the mandrils within them through dies or draw plates, as is  
 " well understood. I have not found it necessary to solder the



" inner tube or lining of Bath metal, the strength being sufficient  
" without, and the water is prevented passing through by reason  
" of the outer tube being complete."

[Printed, 4d. No Drawings.]

A.D. 1848, May 18.—No 12,158.

TAYLOR, WILLIAM.—This invention relates to machinery adapted by four successive operations, to bend long narrow flat plates of malleable metals or alloys of metal into the form of tubes, the edges of such plates being first either feather-edged to form a lap joint, or shaped to abut against each other and form a butt joint. A plate so prepared is laid and fixed over a semi-circular groove formed longitudinally in the upper surface of a sliding table, is pressed upon in succession as the table moves along its horizontal bed, first by the convex periphery of a roller, the axis of which is mounted in fixed bearings directly over the groove; this roller, by pressing the center of the plate partly into the groove causes its edges to rise. The fore end of the plate is next engaged by a second pressing roller, which presses it down to the bottom of the groove, causing the edges to turn more upright. Passing on, the end of the plate next encounters the butt or enlarged cylindrical fore end of a long mandril, the back end of which abuts against and is fixed to the further extremity of the foundation or bed whereon the table slides; this mandril lays in the groove. The fore end of the bent plate having received the butt end of the mandril has its turned up edges next pressed down by two rollers so disposed respectively to operate diagonally, one upon each turned up edge of the plate, as to press upon and lay it round the upper part of the mandril; its edges being thereby brought into contact, are next pressed directly upon by a hollow edged roller, that has the effect of closing the seam, which may be afterwards welded, brazed, or soldered, and the work may be finished by passing the tube through a draw plate or otherwise, according to the description of metal employed, and the intended uses to which such tubes are to be applied.

[Printed, 1s. 2d. Drawing. See London Journal (*Newton's*), vol. 34 (*conjoined series*), p. 22; *Mechanics' Magazine*, vol. 49, p. 525; *Practical Mechanics' Journal*, vol. 1, p. 226; *Artizan*, vol. 7, p. 83; *Patent Journal*, vol. 6, p. 74; *Engineers' and Architects' Journal*, vol. 12, p. 22.]



A.D. 1848, June 15.—N° 12,189.

ROOSE, JAMES and RICHARDSON, WILLIAM HADEN, the younger.—This invention relates to the manufacture of seamless tubes of copper, brass, or other metallic alloys, from cast tubular ingots, which are placed upon a mandril and by means of a pair or more of grooved rollers, are extended lengthwise and reduced in diameter externally. The short thick tubes (cast in the usual way) contain sufficient metal to produce when extended a tube of the required size, the internal diameter of the casting remaining unaltered is the same or nearly the same in the finished tube. Before being submitted to the rolling process, the cast tubes are first cleansed internally and externally, and rubbed inside with some fatty substance to assist the process. The rolling machine employs a pair or more of rollers, each with a corresponding series of semicircular grooves relatively graduating in size, there being small supporting guide rollers back and front grooved in the same manner. The tubular casting is placed upon a suitable mandril, and is gradually reduced by a succession of passes between the rollers, commencing with the larger and finishing with the smaller grooves. By this means the short thick casting is gradually elongated and brought into the form of a tube the desired length and diameter, it being necessary during the process to soften the metal by annealing in an ordinary muffle or furnace, previous to which the mandril is temporarily withdrawn by the chain of a draw-bench, to which it is attached by a key or cottar, the mandril end being slotted for the purpose. It is stated that “by employing grooved rolls with supporting rollers or surfaces, as shewn, and combining therewith the mode of using a draw-bench to remove the mandrils, will offer great advantages over the drawing processes heretofore resorted to, as the metal will be more compressed and condensed.”

[Printed, *6d.* Drawing. See Repertory of Arts, vol. 14 (*enlarged series*), p. 14; London Journal (*Newton's*), vol. 34 (*conjoined series*), p. 115; Mechanics' Magazine, vol. 49, p. 622; Practical Mechanics' Journal, vol. 1, p. 253; Artizan, vol. 7, p. 106; and Patent Journal, vol. 6, p. 107.]

A.D. 1848, September 14.—N° 12,268.

WINFIELD, ROBERT WALTER, and WARD, JOHN.—This invention relates to the manufacture of metallic taper tubes, and of compound or double brass tubes for gas fittings.

1st. The metal to form taper tubes is cut the required size from sheets, and then bent round into a tubular form and the seam soldered; it is then placed on a mandril and drawn through an expanding mould or ring of soft metal, into which the small end of the tube is inserted, and which yields or expands as the tube is drawn through. These tubes may be fluted longitudinally or spirally, in which latter case either the mandril and tube or the yielding mould is, during the process of drawing, caused to revolve.

2nd. Compound tubes are formed by placing two single tubes one within the other, and then drawing them through a draw plate, a mandril being either inserted in the inner tube or not, according to the perfection of the work required. By this process the contiguous surfaces of the two tubes are brought into intimate contact, and a compound tube is produced of increased strength and soundness.

[Printed, 6d. Drawing. See London Journal (*Newton's*), vol. 34 (*conjoined series*), p. 181; Mechanics' Magazine, vol. 50, p. 280; Artizan, vol. 7, p. 208; Patent Journal, vol. 6, p. 235; Engineers' and Architects' Journal, vol. 12, p. 113.]

A.D. 1848, September 28.—N<sup>o</sup> 12,278.

GILLOTT, JOSEPH, and MORRISON, JOHN.—This invention relates to a method of ornamenting cylindric and tubular articles of wood, metal, or other material, including metallic tubes.

Heretofore the process has been confined to producing on the surface of such tubes and articles, lines or indentations parallel with their axes, by drawing them in the direction of their length through fixed dies, and the object of the present invention consists in giving to the ornamental lines, indentations, and other devices, a helical or spiral form, for which purpose whilst the tubes are being drawn through the dies or die plates the latter by means of tooth wheels or other suitable contrivance are caused to rotate. In some cases two dies are employed, one in advance of the other, and respectively made to rotate in an opposite direction, so that the lines formed by one die are crossed by the lines formed by the other die, and an ornamental checkered effect on the surface of the tube or article is the result. The dies may be made either to cut or impress the surface, and the lines of the operating surface of the dies are curved in conformity with the pitch of the spirals.

The dies may be made to rotate intermittently whilst the tube or article is passing through, or the pressure of a die plate may be so increased and diminished, as to produce varied effects of embossing on the surface operated upon, rotary motion in such cases being applied to the tube or article, instead of to the dies or plate.

[Printed, 1s. 2d. Drawings. See Repertory of Arts, vol. 13 (*enlarged series*), p. 360; London Journal (*Newton's*), vol. 34 (*conjoined series*), p. 252; Mechanics' Magazine, vol. 50, p. 305; Artizan, vol. 7, p. 208; Patent Journal, vol. 7, p. 4; Roll Chapel.]

A.D. 1848, October 26.—N° 12,300.

BURROWS, JAMES, and HOLCROFT, GEORGE.—This invention relates primarily to the construction of steam engines, comprising a single cylinder condensing engine, compound high and low pressure engines, mechanical arrangements for producing variable expansion, apparatus for heating feed water, a contrivance for feeding fuel, a self-acting damper, and two modifications of rotary steam engines; it also includes an expansible connection for joining steam pipes.

This expansive pipe joint consists of two large circular plates or discs of sheet metal, each having a central opening in size corresponding to the bore of the pipes, the end of each pipe having cast upon it an ordinary flange, whereto the discs are concentrically and firmly bolted, one to the face of the flange of each pipe. Between the outer margin of these discs when they are brought face to face, is interposed a metallic ring, and by means of nut bolts passing through holes made at regular intervals through the margin of the discs and the ring, they are drawn fluid-tight together, "the space between the discs admitting of  
" any expansion or contraction in the pipes or settlement of the  
" boilers or building without injury or strain upon the joints,  
" and consequently preventing the undue escape and waste of  
" steam."

[Printed, 3s. 10d. Drawings. See Mechanics' Magazine, vol. 50, p. 425; Patent Journal, vol. 8, p. 12; Rolls Chapel.]

A.D. 1848, November 21.—N° 12,334.

YORK, JOHN OLIVER.—This invention relates to the manufacture of seamless metallic tubes, suitable for the flue tubes of steam boilers and for other purposes, and to a method of altering the form of tubes transversely by a process of drawing. The



boiler tubes, made by preference of steel, are produced from cast tubular ingots, which respectively contain sufficient metal when elongated and reduced in diameter, for producing a tube of the desired length and size. The lengthening and reducing of the ingot is effected by a series of pairs of grooved rollers, so placed lineally at intervals, that the ingot, the moment it is taken from a contiguous furnace and has been forced upon a mandril whilst passing through the first pair of rolls, may be immediately presented to and passed through the second pair of rolls, thence through the third pair, and so on until the proper length and diameter are obtained before the metal has time to cool. Two arrangements of rolling apparatus are described, each consisting of a series of pairs of rollers set at intervals in a direct line, a single mandril with an oviform enlargement at one end, being used for carrying the tube upon it through or between all the pairs of rollers of the first series, whilst the second series is furnished with one long fixed mandril, that extends throughout and passes between all the pairs of rollers, laying in their respective grooves, and carrying coincident with the grip of each pair, an oviform enlargement, so that the pressure of each pair of rollers conjointly with the mandril in succession, acts both externally and internally upon the tube, as it is passed along the mandril from pair to pair, the rollers in the latter series being considerably larger in diameter than those of the first.

When required to make wrought iron tubes, the thick metal is bent into the form of a short cylinder, the edges being scarfed and brought together are welded by the pressure, whilst passing between the rolls and the mandril head.

The cylindrical form of tubes is altered by drawing them through dies or openings formed by the closed jaws of tongs, one half of the die opening being cut in each jaw. By this means circular tubes may be made square or of other form with indented sides, without any diminution of the external surface.

[Printed, 10d. Drawing. See London Journal (*Newton's*), vol. 34 (*conjoined series*), p. 337; *Mechanics' Magazine*, vol. 50, p. 498; and *Patent Journal*, vol. 7, p. 70.]

A.D. 1848, December 28.—N° 12,392.

POOLE, MOSES.—(*A communication.*)—This invention relating to screw fastenings and swivels adapted to a variety of purposes, includes also a mode of connecting pipes employed for the con-



veyance of gas and other fluids. The socket end of one pipe is screwed internally to receive the end of the other pipe, which is screw-threaded externally and carries a short distance from its extremity a shallow annular projection or collar; this collar according to the drawing, seems intended for the support of an annular packing, against which the surface of an annular rebate formed inside the end of the socket of the other pipe impinges, when the two pipes are screwed together.

[Printed, *8d.* Drawing. *Mechanics' Magazine*, vol. 51, p. 16; *Repertory of Arts*, vol. 14 (*enlarged series*), p. 351; *Rolls Chapel*.]

A.D. 1849, January 4.—N<sup>o</sup> 12,402.

STEWART, DAVID YOOLOW.—This invention relating to the moulds and apparatus employed in the casting of iron and other pipes and surfaces, refers :—

1st. To the formation of the moulds. The apparatus described is constructed for forming six vertical moulds in hexagonal position in a mould box above. The patterns comprise six short cylindrical pieces, rounded at the ends and fixed on the upper ends of six vertical rods, one on each rod. The lower ends of these rods find a bearing in the moulding apparatus upon a horizontal circular plate, that is made to rise or fall by means of a screw, which passes through a threaded hole in the centre of the plate, and is caused to revolve by tooth gearing. The mould box is made in four sections or lengths disposed one above another, and hinged together by a single vertical bolt. The patterns are raised through holes in the bottom of the mould box gradually, and the sand is introduced above and rammed down in the bottom section of the mould box first, the patterns being kept in position as they rise in the mould box by a ring piece, through which are made six holes to admit the extreme ends of the bars, which pass through and project above the patterns. When the sand is rammed into and the lower section of the mould box is full, the second section is brought into position above the first and filled and rammed, then the third and the fourth sections in turn receive the patterns, which are gradually raised by the screw in the moulding apparatus by the workman as the operation progresses. The sockets or flanges are afterwards formed by separate pattern pieces, which respectively fit to the top of the patterns, and when the moulding is complete the patterns are removed from the top ends of the bars, and the cores resting thereon are

as the latter descend into the moulding apparatus gradually lowered into the moulds. The molten metal is poured into a central aperture, and distributed in the several moulds by a gate-piece, which is formed with six radiating channels.

2nd. Forming moulds in boxes mounted on wheels which run on tramways leading from the moulding apparatus into the drying stove.

3rd. In lieu of straw bands, covering fluted core bars with a composition, consisting of, either sawdust or peat, mixed with a small quantity of clay, which when moulded is dusted over with sand whilst in a plastic state. The cores are driven out of pipes by hydraulic pressure.

[Printed, 1s. 2d. Drawings.]

A.D. 1849, February 28.—N° 12,500.

CUTLER, JOB.—This invention relates to the manufacture of seamless tubes from cast tubular ingots, sword scabbards, metallic tubes suitable for rocket cases, coating tubes with other metals for various purposes, and coating and lining service pipes.

1st. Tubes of brass, copper, or copper alloys, such as Muntz's metal, or Stirling's patent brass, are made from tubular ingots cast in the usual way, and if necessary cleaned by pickling. These tubular ingots are elongated by passing them in a heated state on a mandril between grooved rollers, the process being continued until by a succession of passes through a series of grooves graduating to smaller sizes, a tube of the required length and diameter is produced. The rolling machines preferably employed for the rolling process are those described in the Specification of former Letters Patent granted to this patentee and C. Robinson, Jan. 13, 1848, No. 12,021. After the rolling process the tube is found to be fixed upon the mandril, and in order to loosen it, a system of either hammering or cross rolling has to be resorted to. To effect the last process, three machines are described, the first operates by means of three rollers upon the tube, which is laid between them on the bottom roller in the direction of their length; the second in a similar manner by means of three rollers trigonally placed; and the third by means of two rollers. By means of either of these machines the tube may be crossed rolled on the mandril, whereby the bore of the tube is speedily enlarged, and the mandril set free.

2nd. Sword scabbards. These are made by rolling welded tubes upon a flat steel plate corresponding to the form and size of the sword blade, the rolling being performed both flatwise and edgewise, through separate grooves respectively shaped for the purpose.

3rd. Relates to the manufacture of tubes required to be of uniform thickness and diameter suitable for rocket cases and such like purposes. The skelps are rivetted and either welded or brazed along the seams, and after being rolled in the usual way, they are subjected to the process of cross rolling upon a mandril; this is continued for some time, until the thickness of the metal is equalized, and the tube both internally and externally is made perfectly smooth.

4th. Relates to coating or covering metallic tubes with other metals, which are deposited upon them externally by either electric or galvanic agency.

5th. Service pipes. These are made of sheet iron with lap joints or seams rivetted and welded, the ends being threaded externally to screw into internally threaded union sockets after the manner of connecting gas pipes. After the tubes are so prepared, they are coated externally with other metals or alloys which do not readily oxidize, and internally with enamel of a similar description and after the manner practised in the lining of iron vessels used for domestic purposes.

[Printed, 1s. 10d. Drawings. See *Mechanics' Magazine*, vol. 51, p. 212, and *Patent Journal*, vol. 7, p. 213.]

A.D. 1849, March 14.—N° 12,509.

SHANKS, ANDREW.—The object of this invention relating to a process of casting pipes, cylinders and hollow vessels, is to obviate the necessity for using cores. To this end the casting of tubular articles "is effected by pouring the liquid metal into hollow cylindrical moulds placed in a horizontal position (the internal diameter of which corresponds with the external diameter of the pipe, tube or cylinder to be produced) and by giving the said moulds a rotatory movement, so that the centrifugal force produced causes the liquid metal to spread itself to a uniform manner throughout the interior surface of the mould, the thickness of the pipe, tube, or cylinder produced being dependent upon the quantity of metal poured into the mould."

Other hollow articles, such as pans, basins, and the like, are cast in moulds superposed on vertical spindles, which are caused to rotate whilst the metal is in a molten state.

[Printed, 6d. Drawing. London Journal (*Newton's*), vol. 85 (*conjoined series*), p. 175; *Mechanics' Magazine*, vol. 51, p. 282; *Practical Mechanics' Journal*, vol. 2, pp. 166 and 208; *Patent Journal*, vol. 7, p. 247; *Engineers' and Architects' Journal*, vol. 12, p. 334; *Rolls Chapel*.]

A.D. 1849, March 26.—N° 12,534.

PARKES, ALEXANDER.—This invention relates to depositing by electric agency, coatings of metal and metallic alloys in successive layers, on pipes, cylinders, and other articles, or in otherwise coating such metallic articles with other metals; it also relates during the manufacture of metals and alloys, to blowing air or gaseous fluids over the surface of such metals whilst in a melted state in the refining furnace, to the use of a special kind of blowing machine in smelting ores, and to other metallic processes.

Casting tubular printing rollers in a metallic alloy consisting of iron, silver, nickel, and their alloys combined with phosphorous, the proportions being from 2 to 10 per cent. of phosphorous, to either of the above metals, iron moulds and sand cores being preferred.

Copper printing rollers which have been reduced by use and wear have cast upon them a coating of a suitable phosphorated metallic compound, whereby they are restored to their original size for re-use.

Forming a printing “roller or cylinder of iron, of brass, or of white metal, composed of tin, lead, zinc, and antimony, in various proportions, and giving to the same a copper surface by means of electric deposition, employing the well-known solutions of copper for this purpose; but if composed of iron or white alloy, I prefer the solution of copper in the cyanide of potassium, using the solutions at a temperature of about 150° Fahrenheit, and keeping the rollers or cylinders placed in a horizontal position and in constant motion during the time the deposition takes place.”

[Printed, 6d. Drawing. See *Repertory of Arts*, vol. 14 (*enlarged series*) p. 381; *Mechanics' Magazine*, vol. 51, p. 309; *Patent Journal*, vol. 8, p. 42; *Rolls Chapel*.]



A.D. 1849, April 16.—N° 12,566.

**PIROU, LOUIS PROSPER NICHOLAS DUVAL.**—This invention relates to the application of concrete or "beton" which is inserted or moulded between two surfaces to form tubes, pipes, hollow and solid pillars, flags and curbs, adapted to the construction of breakwaters, piers, lighthouses, quays, and a variety of other purposes.

These concrete pipes, tubes, pillars, etc. are formed in sheet iron cylindrical and other shaped moulds, placed in parallel rows both vertically and horizontally, and bound, cramped, or fixed together according to the design or nature of the work to be performed. In some cases the interspace between the rows of tubes placed either horizontally or vertically is filled with the concrete, and the tubes themselves are left empty. The diameter of such tubes as would be used in the construction of a break-water and pier, where the water at low tide is about fifteen feet deep, is four feet, and their length eighteen feet.

[Printed, *8d.* Drawing. See *Mechanics' Magazine*, vol. 51, p. 378; *Patent Journal*, vol. 8, p. 87.]

A.D. 1849, September 20.—N° 12,776.

**PEACE, WILLIAM and EVANS, EDWARD.**—This invention relating to steam engines and pumps, refers to the construction of pistons, avoiding the use of the bolts and nuts which are usually employed, and to an expansible union joint for connecting together the ends of pipes, which are cast with ordinary flanges. The union junction is formed with two large circular plates, which are concentrically bolted, one to the flange of each pipe, each plate having a central hole corresponding in diameter to the size of the internal bore. When the ends of the pipes are placed in position for being coupled together, the circular plates are brought face to face, and by means of nut bolts and corresponding holes made through each at equal distances apart all round their outer margins they are firmly fastened together, an annular packing extending all round, being interposed between their margins to keep them slightly apart. All the joints are made steam or fluid-tight and when either expansion or contraction of the pipes takes place it is compensated by the flexibility of the plates, which will yield either to pressure or tension.

[Printed, *8d.* Drawing. London Journal (*Newton's*), vol. 36 (*conjoined series*), p. 305; *Mechanics' Magazine*, vol. 52, p. 221; *Patent Journal*, vol. 8, p. 308; *Rolls Chapel*.]

A.D. 1849, October 5.—N° 12,795.

NEWTON, ALFRED VINCENT. — (*A communication.*) — This invention relates to mechanical appliances designed for the formation by pressure of the moulds and cores adapted for casting pipes and tubes. The mould flasks or boxes are formed as usual in two half parts, that are separately filled with moulding sand and receive the impression of the pattern, which in form is exactly one longitudinal half of a pipe or cylinder, laid upon and projecting from a true parting plate or surface inverted and attached to the upper beam of a press. One half flask is placed upon a carriage which is brought beneath a sand box, and when filled and moved directly under the top beam of the press, is raised by the lower or moveable beam of the press, and forced upwards against the pattern and plate, which compresses the sand in the flask, and leaves there the impression of the pattern. By this means, it is stated, the sand is rendered as uniformly solid throughout the whole length of the flask as if it were rammed in by the hand of an experienced moulder, and the whole operation may be conducted by unskilled labour. The gates of the mould are formed at the same time, the half flasks being afterwards paired together preparatory to the casting process. If thought advisable the pattern may be a perfect cylinder sunk exactly one half into the parting plate, so that after the first impression is made, the mould may be coated with facing sand and again pressed against the pattern, which if then turned on its axis, will render its impression in the mould very smooth.

The cores employed are mechanically made by pressing the sand laterally by means of four longitudinal concave dies, each representing 90° of a circle, against the surface of a core bar formed by coiling wire helically over the surface of a cruciform foundation. The green sand thus forms a crust which becomes fixed in the interstices of the wire coils, through which the gas and vapour generated in the mould when the metal is poured in freely escapes; these cores do not require drying.

Describes a mode of casting eight pipes at one operation by means of a vertical "sprue case," down which the metal is poured and distributes itself through eight radiating passages that lead to the eight moulds, which are vertically circumposed around it.

[Printed, 1s. 6d. Drawings. See London Journal (*Newton's*), vol. 37 (*conjoined series*), p. 8; *Mechanics' Magazine*, vol. 52, p. 298; and *Patent Journal*, vol. 9, p. 21.]

A.D. 1849, October 12.—N° 12,812.

**BANISTER, JAMES.**—This invention, relating to the manufacture of tubes adapted to the construction of locomotive and other steam boilers, consists :—

1st. In combining three thin tubes of different metals, respectively copper, iron, and brass, so arranged one within another as to form one tube, which when finished has a brass lining to receive the rush of flame and products from the furnace, a copper exterior in contact with the water, and an intermediate lamina of iron to support and stiffen it. When the fire is intended to act externally on the tube, the arrangement is reversed, the interior of the tube being made of copper, and the outside of brass. In the first instance the thin tubes are made separately of correct sizes which will slide one within the other, brazed tubes by reason of their thinness being preferred. A slightly tapering mandril is then inserted in the combined tubes, which are next drawn through dies until they are relatively brought into intimate contact, the thin tubes having severally been annealed previous to their combination.

2nd. Uniting the seams of tubes of brass or of other alloys of copper. Having bent the sheet metal into the form of a tube so that the edges come together, an angular gutter is made along the seam by removing or chamfering, by means of a triangular file, the outer angle of each edge. The tube is then filled with sand, and a sand ridge is formed along each side of the gutter to increase its size and depth. In this condition when the tube is heated to a bright red, melted metal of the same kind as that of which the tube is composed, is poured into the gutter; the hot fluid metal partly fuses the edges of the seam, and sets when cold in a solid ridge, that is afterwards removed by a circular saw. The tubes placed upon a mandril are then passed between grooved rollers, and finished by drawing through dies.

[Printed, 4d. No Drawings. See Repertory of Arts, vol. 15 (*enlarged series*), p. 295; London Journal (*Newton's*), vol. 37 (*conjoined series*), p. 183; Mechanics' Magazine, vol. 52, p. 317; Engineers' and Architects' Journal, vol. 13, p. 230; Practical Mechanics' Journal, vol. 3, p. 94; Patent Journal, vol. 9, p. 19.]

A.D. 1849, December 3.—N° 12,875.

**BUCHANAN, GEORGE.**—This invention relating to the construction of cocks, valves, gauges, stoppers, and pipe joints *refers first to the construction and form of the bearing surfaces*

of the valve orifice and lid, and in the use of a membrane of vulcanized india-rubber or other suitable elastic substance immediately distended between them.

Describes other modes of adapting a flexible membrane to similar purposes, including an air chamber or cushion which is partly formed by the membrane itself.

A boiler feed apparatus which may be situated at any convenient distance from the boiler and may be examined in detail without stopping the engine. The pressure on the feed water is made equable by the use of an air-vessel.

With regard to the making of joints of pipes and other vessels the inventor says it "is done in various ways by bringing the narrow bearing surface of the end of the pipe into contact with the membrane distended across a narrow ring or cavity, and pressing them together by screws or otherwise, whereby a secure joint is formed with greater facility and less mutual pressure than by the usual means, and this also I apply particularly to the coupling joints in water, gas, or steam pipes, and to the moveable joints in gas pipes, and I also extend the use of the said moveable joints, constructed with the same flexible membranes, in various ways to water and steam pipes."

[Printed, 10*l*. Drawings. See Repertory of Arts, vol. 16 (*enlarged series*), p. 1; Mechanics' Magazine, vol. 52, p. 438; Patent Journal, vol. 9, p. 114; Rolls Chapel.]

A.D. 1850, January 3.—N<sup>o</sup> 12,918.

COCHRANE, ALEXANDRE BRODIE, junior, and SLATE, ARCHIBALD.—This invention relating to the process of manufacturing cast-iron pipes, glazing such pipes internally, and bending skelps, consists in :—

1st. Progressively raising and guiding the pattern by "suitable tackle attached thereto" as the successive sections of the mould box are filled with sand and the mould formed, the sections varying lengthwise, so that pipes of various lengths may be produced, the guide consisting of a central rod.

2nd. Ramming the sand round the pattern as the mould fills, by means of a mechanical rammer with four operating heads, that drive down and harden the sand in the annular space between the mould-box and the pattern, which is gradually raised in the box as the mould is formed, the rammer in addition to its quick up and down motion derived from eccentrics, being at the same time *caused to revolve slowly* by means of a ratchet wheel and pawl.



3rd. An apparatus for drying moulds consists of an external cylindrical casing, wherein the mould box is placed, and through which the hot draught from a contiguous furnace is directed by a blast.

4th. Relates to the drying of cores in ovens from which the damp vapours are drawn by means of pumps, whereby (it is stated) the process of drying is greatly facilitated.

5th. Causing the inside of pipes during the process of casting to become coated with a lining of glass. This is effected by covering the core with a compound that will liquify by the application of heat, and becoming attached to the metal, will form a glaze. This compound in a powdered state consists of thirty parts of flint glass, twenty parts of carbonate of soda, and twelve parts of boracic acid, melted and mixed together, and when cool ground to a powder, which mixed with gum or other adhesive matter, may be applied to the core either in a wet or dry state.

6th. Bending skelps used for the manufacture of wrought-iron tubes by means in the first instance of suitably formed dies, which progressively bend the skelps, preparatory to their passing through rollers, that bring them into the required tubular form,

[Printed, 1s. 10d. Drawings. See Repertory of Arts, vol. 16 (*enlarged series*), p. 65; Mechanics' Magazine, vol. 53, p. 17; and Patent Journal, vol. 9, p. 167.]

A.D. 1850, January 11.—N<sup>o</sup> 12,922.

BURTON, BENNETT ALFRED.—This invention, relating amongst other things to the emptying and flushing of cesspools and drains, and to the pumps and valves employed for the purpose, refers also to the making of the suction and delivery pipes, and to the mode of connecting or jointing them. The pipes for this purpose are made of sheet iron sufficiently thin, that when formed and jointed together, they may possess a certain amount of flexibility, and so be able when laid down to accommodate themselves to inequalities of the surface of the ground. The flexible joint consists, having placed two pipe ends in a direct line, in sliding over the junction a short length of thin metal pipe, and over this a longer piece of india rubber tubing, the respective ends of which are tightly bound and secured, one on the end of each pipe.

Flanged pipes are connected together by a wrought-iron strap, the lower part of which is made with a hook that projects over the edge of the flanges, and takes hold of or bears against one side. *The upper ends of the strap are slotted to receive a key which*

draws the flanges together, a vulcanized india-rubber ring or other suitable packing being disposed between them. Flanged pipes are also connected together by means of three jointed levers.

Socket pipes are connected by means of a stud projecting inside the socket which takes into a right angular slot formed at the plain end of the other pipe which, when inserted in the socket is slightly turned, so that the stud slides into that part of the slot which takes the transverse direction; a piece of vulcanized tubing is then drawn over the junction and bound on the respective ends of the two pipes, on one by means of a screw clip, and on the other with copper wire.

[Printed, 10d. Drawing. See *Mechanics' Magazine*, vol. 53, p. 56; *Patent Journal*, vol. 9, p. 189.]

A.D. 1850, March 26.—N<sup>o</sup> 13,024.

NEWTON, ALERED VINCENT. — (*A communication.*) — This invention relates to a method of coupling the ends of pipes for the purpose of connecting them together in a continuous length. These pipes require neither flanges nor socket, but around each end side by side are a few shallow grooves, and around one end of each pipe a short distance from its extremity, is a shallow projecting collar. Before the meeting surfaces or ends of two pipes about to be connected are placed in position, a soft metallic sleeve or tubular collar of lead is placed or slid on the end of that pipe which presents its plain end, and when the two pipes are drawn together, the metallic sleeve which tapers slightly externally is pushed back over the joint and up against the shallow collar on the end of the other pipe. A short iron tube tapering internally is then slid over the lead, and being driven on, the lead is made to tightly embrace the pipe ends, the annular ridges thereon formed between the grooves, make by sinking into the soft metal, a fluid-tight joint.

[Printed, 6d. Drawing. See *London Journal (Newton's)*, vol. 37 (*conjoined series*), p. 254; *Mechanics' Magazine*, vol. 53, p. 275; *Patent Journal*, vol. 10, p. 13; *Rolls Chapel*.]

A.D. 1850, April 11.—N<sup>o</sup> 13,035.

PROSSER, RICHARD.—This invention relates to machines or apparatus adapted to the preparation of the metal plates, and to other machines adapted to the manufacture of such plates into metallic tubes, and applicable to other purposes where pressure is required; also actuating these machines by the application of

steam power, and to the mode of applying metal tubes to steam boilers and other vessels.

1st. Consists in the formation of compound cutting tools, for planing at one operation the edges of two flat plates, which edges are intended to lap to the opposite edge of such plates respectively when formed into tubes. These cutting tools, which have several distinct cutting edges that act in succession, are adapted for use in planing machines, on the sliding table of which during the cutting operation, the plates are firmly fixed edgewise.

In rolling a metal plate which is intended for forming a cylindrical tube, the metal along each margin near the two edges, is made thicker than the body of the plate, and such plates may be made of double width, to be afterwards divided; and for the purpose of flattening or taking them out of winding, they are passed and repassed through a machine between rollers, until they are brought to the true state of flatness required. After being so prepared, the two edges of each are sheared straight and relatively parallel, when the tubes throughout their length are intended to be of the same diameter, by revolving shears, such as are described in a former specification of this inventor, dated November 1st, 1845. These shearing machines somewhat modified in construction, shear both edges of a plate or the outer edges of two combined plates simultaneously, and then by a third pair of shears in the machine the two plates which are combined are separated.

2nd. This part of the invention is also supplementary to the said former specification. It relates to the combining in one machine, apparatus for turning up the edges, pressing the centre of the turned up plate into a semicircular bed mould, and giving the plate a cylindrical form by means of a pair of semicircular dies, which three operations were according to the last invention performed separately. The three sets of operating apparatus are disposed in the machine one above the other, that which turns up the edges being beneath the others, and that which finishes the cylindric form at the top, the plates being moved a stage higher between each stroke of the machine, so that at each stroke a fresh plate is introduced into the bottom section and turned up, and a plate formed into a cylinder is delivered from the top, the new machine being actuated by steam instead of by hydrostatic pressure as formerly. The seams of these tubular shells are afterwards closed by welding or brazing.

3rd. *Describes the combined steam engine and hydrostatic machinery employed for working or driving the combined machine.*

4th. Relates to fixing the ends of boiler tubes in their sheets or tube plates. This is effected by the use of hoops or ferrules which, instead of being forced or driven inside the tube end, so as to expand the latter and compel it to bed against the inside surface or edge of the conical hole in the plate, are respectively forced in between the tube ends and the surface of the hole.

[Printed, 7s. 4d. Drawings. See *Mechanics' Magazine*, vol. 53, p. 316; *Patent Journal*, vol. 10, p. 29.]

A.D. 1850, April 15.—N° 13,037.

CHAMEROY, EDMÉ AUGUSTIN.—This invention relates to the manufacture of tubes made of iron, copper, or other metallic cylindrical ingots, or masses containing a sufficient quantity of metal to make, when reduced and drawn out, a tube of the desired length, size and substance. The first stage of this part of the process consists in passing the cylindrical mass repeatedly between two plain surface rollers; the first pass reduces it in transverse section to an ovate form, the second flattens it, and in the subsequent passes it is gradually elongated and reduced in thickness, having the appearance of two narrow thin sheets or strips of metal united at the edges. The next process consists in opening these two sheets to form a hollow tube, which is effected by a conical enlargement formed on the end of a long mandril that is forced between them by suitable contrivances. By this means the tube is formed, having two ribbed projections, one on each opposite side. These projections may either be sheared off or left, according to the use for which the tubes are required.

Other machines called curvilinear pressing machines are intended more particularly for the manufacture of bolts and small tubes. For this purpose two machines differing in mechanical construction are described. In the first machine two rollers are mounted upon a movable wheel; the mass of metal to be operated upon is fixed, and it is compressed between rollers revolving with the wheel, whereas in the second machine the mass of metal is movable and is compressed between rollers mounted on a fixed framing, and rotated by suitable gearing. These two rollers press strongly upon the mass and cause it to revolve, whereby it is lengthened out and receives a cylindrical form. Bolts are made from solid malleable metal masses, and tubes from those which are hollow.

*Another machine for drawing or extending metallic masses on a mandril to form tubes, operates by means of two bars, which*



move alternately to and fro rectilinearly, resting across a series of supporting rollers; the mass as it is reduced descends vertically between the bars, which are pressed towards each other by rollers set up by screws; motion is given to the bars respectively by a two throw crank.

[Printed, 1s. 10d. Drawings. See Mechanics' Magazine, vol. 53. p. 318; Patent Journal, vol. 10, p. 34.]

A.D. 1850, April 15.—N<sup>o</sup> 13,042.

ATTWOOD, GEORGE.—This invention relating to the manufacture of tubes of copper or its alloys, consists in forming such tubes from old "copper rollers" such as are made to be engraved with ornamental designs and used by printers of calico and other materials. These rollers when worn and no longer fit for their original use, have first, by means of suitable boring lathes, all the ribs, slots, and projections removed from their interior. They are then, being heated to a red heat, placed upon steel mandrils and drawn out in length or extended and also reduced in diameter, by an ordinary rolling process, the rollers between which they are passed being furnished with grooves of the required form and size. By this means tubing of copper or copper alloyed is produced from old "copper rollers" of any desired diameter and substance, suitable for use in the construction of steam boilers, parts of steam engines, in breweries and distilleries, for gas fittings and other purposes where such tubing is required.

[Printed, 4d. No Drawings. See London Journal (*Newton's*), vol. 37 (*continued series*), p. 184; Mechanics' Magazine, vol. 53, p. 277; Patent Journal, vol. 10, p. 5.]

A.D. 1850, April 23.—N<sup>o</sup> 13,054.

RITCHIE, WILLIAM HENRY.—(*A communication.*)—This invention relates to machinery adapted by a process of rolling, to to extend or elongate tubes cast of brass, copper or other suitable metal. The machine comprises two circumferentially grooved rollers, horizontally disposed relatively parallel one directly above the other in suitable housings or side frames, provision being made for setting down the top roller so as to increase or diminish the distance between them by means of two screws. The circumference of each of these rollers is paracentric, forming in relation to their centers respectively a gradual incline, so that the half circular grooves cut round them, regularly graduate in depth from one end to a certain point, where the paracentric periphery is broken by a radial step. The tube to be operated upon is cast

somewhat tapering, and when its end is presented to the rollers and nipped by them, it is gradually drawn in. When the rollers have nearly made a revolution their motion is reversed and the tube returns, a certain length nearly equal to the whole circumference of the rollers having been gradually elongated and partially reduced in size. The tube is then slightly turned and again presented to the grooves and drawn between the rollers, and again returned to the workman when the motion is reversed, and this operation is repeated until the whole length of the tube has been lengthened and reduced to the desired size.

By this means tubes may be made either longitudinally parallel or tapering, and if desired they may be made to taper from the centre towards each end; a strong collar or annular enlargement may also be formed either at the centre or at one end.

[Printed, 6d. Drawing. See Repertory of Arts, vol. 16 (*enlarged series*), p. 339; London Journal (*Newton's*), vol. 38 (*conjoined series*), p. 29; *Mechanics' Magazine*, vol. 53, p. 332; Patent Journal, vol 10, p. 43.]

A.D. 1850, May 25.—N° 13,083.

**HICKMAN, JOHN.**—This invention relates to the apparatus and dies employed for drawing tubes of brass or other soft metals, and to a mode of fluting tapering tubes.

The apparatus employed for drawing tubes comprises a wooden frame, wherein are disposed two horizontal and two vertical holding bars that collectively by means of weights are caused to close laterally against the sides of the tube (which has a soldered seam) and hold it in position. Wire coiled and strained round the tube, constitutes an expanding and contracting die, the ends of the wire leading off in opposite directions after coiling around the tube, are passed over pulleys and drawn down by attaching thereto heavy weights or springs, that maintain a uniform tension of the wire, and will yield to any increase or diminution in the size of the tube, which is supported internally by a mandril, either parallel or tapering as the case may be, whether the tube is required to be tapering or otherwise. Whilst a tapering tube and mandril are being drawn through, the wire die is held back by contact respectively with the front edges of the four holding bars, the wire coil expanding and contracting, and the holding bars relatively opening or closing gradually as the size of the tube increases or diminishes in diameter.

The fluting of tubes tapering or otherwise is effected by the use of a grooved mandril inside the tube, and a circumposed series of

metallic bars or strips longitudinally disposed outside coincident with the grooves in the mandril, into which the metal of the tube is forced by the several bars or strips under the compression of a soft metal die, which will yield to the increasing diameter of the tube and mandril as they are drawn through.

[Printed, 8d. Drawing. See *London Journal (Newton's)*, vol. 38 (*conjoined series*), p. 99; *Mechanics' Magazine*, vol. 53, p. 438; *Patent Journal*, vol. 10, p. 102.]

A.D. 1850, June 12.—N<sup>o</sup> 13,130.

DEAKIN, THOMAS.—This invention, relating to the manufacture of metallic tubes, refers more particularly to the machinery and apparatus employed for the purpose, and also for bending tubes. It consists in :—

1st. Bending and welding the wrought-iron plates or skelps by means of a pair of bending rollers and a series of pairs of grooved rollers, so disposed in a direct line, that the plate which is first presented to the bending rollers at a welding heat, and bent by them into a semicircular form, passes thence in succession through the several pairs of grooved rollers, which gradually bring it into the cylindrical form of a tube, and finally weld the seam. When however the metal is too thin to maintain a welding heat throughout the process, the skelp at an ordinary heat is first bent and brought into the tubular form, and then after being heated to a welding heat, is again passed through grooved rollers, which squeeze and weld the edges together.

2nd. Apparatus for manufacturing tapering tubes. This consists of a series of pairs of grooved rollers similarly arranged as the preceding, only that the grooves in the rollers gradually vary in breadth and depth, increasing and diminishing to and from two opposite diametral points; but when tubes of uniform diameter externally and with tapering bores are required, the skelps used are so prepared, that there is a gradual increase in their thickness from end to end. The mode of cutting the varying grooves in the rollers employed for manufacturing taper tubes, is described.

3rd. Rolling cylindrical tubes by compression into trilateral and other forms suitable for railway rails and other purposes, by means of disc rollers so disposed, that their peripheries are collectively projected towards the central point occupied by the tube.

4th. The process of bending tubes into convoluted spiral forms, is effected by means of a pair of tapering rollers spirally grooved in opposite directions, or respectively right and left-handed, &c

caused by tooth wheels on their axes to revolve at a uniform speed, so that their half circular grooves always coincide and form at the meeting points perfect circular openings, wherein as they revolve the tube is drawn, and laying in the groove is coiled round one of the rollers, which in order to remove the tube must be afterwards lifted out of its bearings.

5th. Helical tubes are bent into form by spirally grooved rollers in a similar manner, only that the rollers instead of being made tapering are parallel throughout their whole length, and when either left or right-handed spiral tubular helices are required, the tube is coiled round and is laid in the groove of that roller which corresponds. This apparatus may be employed in combination with the rolling machine first described.

[Printed, 1s. 2d. Drawings. See *Mechanics' Magazine*, vol. 53, p. 499; and *Patent Journal*, vol. 10, p. 125.]

A.D. 1850, June 12.—N<sup>o</sup> 13,133.

EVERITT, GEORGE ALLEN, and GLYDON, GEORGE.—The object of this invention, relating to metallic tubes adapted to locomotive and other boilers, is to remedy the tendency of wearing away to which those ends of the tubes disposed nearest the fire are liable, whilst the other portion of such tubes is scarcely deteriorated. It consists in lining or inserting into that end of each tube which is liable to wear, another smaller tube of brass, iron, copper, or other metallic alloy, the length of such lining tubes to be from one to two feet.

“ Having prepared a tube of the whole length required in the  
“ ordinary way, we take the shield and place it upon a steel man-  
“ dril necked or turned at one end to the length of the shield or  
“ rather more, . . . . we then proceed to put the other tube  
“ upon the mandril covering the shield or inner tube, and draw  
“ them upon the mandril through a die upon a draw bench in  
“ the ordinary manner of drawing tubes, and we afterwards  
“ withdraw the mandril, which is tapered to facilitate its with-  
“ drawal. Or the exterior tube may be prepared and finished  
“ with the required taper upon a mandril or otherwise; or it may  
“ be parallel, and the shield or inner tube may also be prepared  
“ upon a separate mandril, making this tube also taper in the  
“ interior, if required, and finishing it so as to fit tightly within  
“ the outer tube, into which we drive it by power or otherwise.  
“ *This inner shield or tube will answer the purpose of a ferrule,*  
“ *and can be used as such or with the ordinary ferrules now in*



"use;" the length of the shield tube must in no case be less than half its diameter.

[Printed, *6d.* Drawing. See London Journal (*Newton's*), vol. 38 (*conjoined series*), p. 107; *Mechanics' Magazine*, vol. 53, p. 497; *Patent Journal*, vol. 10, p. 127.]

A.D. 1851, January 2.—N° 13,438.

COOK, BENJAMIN.—This invention relating to "the manufacture of metallic tubes" was not further described.

[No Specification enrolled.]

A.D. 1851, February 10.—N° 13,499.

FAIRBAIRN, PETER, and HETHERINGTON, JOHN.—This invention relating to a system of plate moulding, is supplementary to prior Letters Patent granted to these inventors, and dated July 31, 1850, No. 13,208. Since that time the inventors have extended the use of their said patented invention, (originally confined to the casting of parts of manufacturing machinery and mechanical tools) to the preparation of the moulds for casting pipes, parts of agricultural implements, and other articles, cores of the ordinary kind when required being prepared and used as heretofore. As described in the former Specification the pattern or model is divided into two flat sections at its broadest part, and each part is so fixed, one on each side of a plate of uniform thickness, that the position of one part is exactly opposite the position of the other. In this way the two half parts of models of various articles may be closely arranged respectively on the two sides of the plate, and connecting channels for the distribution and general flow of the molten metal in the several moulds are made by arranging suitable pieces between them; thus, the two sections or parts of the model of a portion of an agricultural implement, an ornamental balustrade, a pipe, and a rail, may all be arranged in coincident positions respectively on the opposite sides of a plate and moulded at the same time. The plate is placed between the two moulding boxes, the pin guides passing through it; the sand is then rammed in at the back of each box respectively, and when both are filled, one box is lifted off the other and then the plate with the half models (which leave their impressions in the sand of each box) is removed. The two boxes are then coupled face to face for casting, the two faces of the plate having formed a true meeting surface on the sand of each box.

[Printed, *8d.* Drawing.]

M. P.

A.D. 1851, February 26.—N° 13,534.

RÉMOND, AMÉDÉE FRANÇOIS.—(*A communication.*)—This invention relates to the manufacture of tubes from circular plates or discs of metal which in the first stage of the process are subjected to the operation of a series of stamping and pressing dies and swages, and thereby gradually brought into forms cup-shaped, with parallel sides. The next stage in the process consists in driving these cup-shaped pieces through a succession of dies or matrices by means of a mandril directly forced forward by the agency of steam, and by this means the parallel sides of the cup-pieces are elongated, and by degrees they are lengthened or drawn out into the form of tubes. The metal may be worked either hot or cold according to its ductility and nature, annealing if cold being resorted to when required. Instead of dies or matrices grooved rollers may be employed.

Two kinds of motive power apparatus are employed for driving or thrusting the mandril. The first consists of a strong horizontal bed or frame, whereon at one end is fixed in the direction of its length a steam cylinder with piston and piston rod, which carries at its outer end a cross-head, that when moving, slides on and is supported by suitable guides. One end of the mandril is fixed in a socket carried by the cross-head, so that the mandril forms an elongation of the piston rod, and they point directly to the dies, which are fixed at the opposite end of the machine. When in operation the steam acts against the back of the piston, which drives the piston rod forward and forces the mandrils directly through the dies or rollers, suitable contrivances being arranged for operating the valves which regulate the induction and exhaustion of the steam.

The second apparatus for thrusting the mandril is placed in a vertical position, and is operated by means of an hydraulic ram.

Two other machines in which the thrust of the mandril is given mechanically, one by means of a screw and the other by a rack are also described. In these machines respectively instead of dies, rollers with a series of grooves relatively graduating in size are employed. After each pass and withdrawal of the tube from the rollers, the latter are caused to move endwise, and by this means all or as many of the different sized grooves as are required, are in succession from the largest to the smallest brought into operation. These last machines are more particularly adapted to the manufacture of gun barrels and similar articles, and they may

either be driven by motive power or by hand. The extreme end of the tube which receives the thrust of the mandril being closed, requires finally to be cut off.

[Printed, 1s. 6d. Drawings. See *Mechanics' Magazine*, vol. 55, p. 197; and *Patent Journal*, vol. 11, p. 282.]

A.D. 1851, March 24.—N° 13,573.

**WALKER, SAMUEL, junior.**—This invention, relating to the manufacture of metallic tubes, refers to the process of bending the skelps into a tubular form by means of suitably grooved rollers, which at the same time bevel the edges; also to a furnace adapted to the purpose of soldering the seams. The bending rollers are mounted as usual between suitable side frames, which support the bearings wherein their axes revolve, and they are driven at a uniform speed by tooth gearing. In the bottom roller there are two semicircular grooves, which pair with two grooves in the top roller, one of which is so curved as to cause the edges of the skelp to lap one over the other, and the other groove being semicircular forms with the corresponding groove in the other roller, when the two are in position together, a perfect circular hole between them. The skelp previously bent transversely throughout its whole length into a U-shaped form, is by the first pass on a supporting mandril through the lapping groove of the rollers, made tubular, the edges lapping, and the second pass on a mandril through the circular grooves by bringing the edges abutting together, cause it to assume a circular form.

The furnace is employed for heating and soldering the seams. The tubes are heated in a chamber or oven erected contiguous to the fire-place, and in the direct passage of the hot draught, which is caused to pass either over or under the tubes according to the manner in which the solder is laid, whether along the seam internally or externally, so as to heat one side only of each tube. The fuel is introduced through an opening in the top directly over the fire. Several tubes placed side by side in the heating chamber may be soldered at the same time.

[Printed, 6d. Drawing. See *London Journal (Newton's)*, vol. 40 (*conjoined series*), p. 24; *Mechanics' Magazine*, vol. 55, p. 277; *Engineers' and Architects' Journal*, vol. 40, p. 523; and *Patent Journal*, vol. 12, p. 14.]

A.D. 1851, June 7.—N° 13,656.

**BANISTER, JAMES.**—This invention relates to the process of soldering or brazing the seams of tubes, which are uniformly



heated in a muffle or oven, instead of as heretofore in a fire until the solder runs, the object being to protect the metal of which the tubes are composed, as such metal when placed in a fire is liable to injury at those parts exposed to the fiercest heat, whereas by the aid of this invention any desired length of tube may be heated uniformly. In order to effect this result a furnace with two fires is specially constructed, and their respective flues arranged to direct their hot draughts upon one point, and course together across the muffle or oven, through which the tube is slowly passed by the workman, the joint being kept upwards. The edges of the tube are overlapped, and the solder, which is a combination of low and high melting, or weak and strong, is applied in the usual manner, No. 1 consisting of 40 parts by weight of spelter, and 36 parts of copper, and No. 2 of 40 parts of spelter and 42 of copper. These solders are prepared separately, and afterwards mixed in a powdered state, equal parts of each with borax.

[Printed 1s. Drawings. See Repertory of Arts, vol. 19 (*enlarged series*), p. 15; *Mechanics' Magazine*, vol. 55, p. 496; *Engineers' and Architects' Journal*, vol. 14, p. 640.]

A.D. 1851, September 4.—N<sup>o</sup> 13,734.

KENRICK, TIMOTHY.—This invention relates to the process of enamelling and glazing the internal surface of wrought-iron tubes. For this purpose two compositions are used, the first constituting the enamel or body, and the second the glaze. The first composition consists of flint, borax, and potter's clay in the following proportions:—100 lbs. of calcined flint ground fine, and 70 lbs. of borax mixed well together and fused; when cold add 21 lbs. of potter's clay and grind in water, bringing the compound mass to such a consistence that an article dipped in it will be coated to the thickness of about  $\frac{1}{16}$  of an inch. The inside of the pipes must be well cleaned before this composition is poured in, and the pipes must be moved round so as to insure a uniform coating internally. When this composition is set, the second composition or glaze powder is introduced, turning the tube as before, so that every part of the first coating may be covered by the powder, which will adhere thereto. The tube is then placed in a stove and dried, and it is afterwards fired in a kiln or muffle, which must be sufficiently heated to fuze the glaze. The second composition or glaze powder is made as follows:—To 100 lbs. of Cornish stone ground to a powder add 117 lbs. of *fine ground borax*, 35 lbs. of soda ash, 35 lbs. of saltpetre, 35 lbs.



of sifted slaked lime, 13 lbs. of white sand, and 50 lbs. of pounded white glass; the whole are to be mixed well together, and perfectly vitrified; when cool the mass is to be ground very fine in water and afterwards dried. Mix and stir well together in hot water 45 lbs. of the product with 1 lb. of soda ash, and when dried in a stove a fine glaze powder will be produced.

[Printed, *Ad.* No Drawings. See Repertory of Arts, vol. 19 (*enlarged series*), p. 242; London Journal (*Newton's*), vol. 40 (*conjoined series*), p. 283; Mechanics' Magazine, vol. 56, p. 215; Engineers' and Architects' Journal, vol. 15, p. 144; Artizan, vol. 10, p. 113; and Journal of Gas Lighting, vol. 2, p. 336.]

A.D. 1851, September 25.—N° 13,752.

GREEN, CHARLES.—According to this invention, cast tubes after having been extended by drawing them through a succession of dies are, before the last drawing process, after being annealed, “pickled or treated with diluted acid as heretofore practised after “the last time of passing or drawing such tubes through dies or “holes; the tubes are then to be washed with cold water and “then boiled in water ten or fifteen minutes; the tubes are then “immersed in a solution of soap for five or six minutes. I prefer “to employ soft soap for the purpose, and use the same at the “rate of five pounds of soft soap to three gallons of water. The “tubes are then taken from the solution of soap and drawn “through the last die or hole, suds or solution of soap, being “caused to flow constantly on to the parts of the tube as they “come up to the die or hole through which a tube is being “passed. The brass tubes thus made are to be annealed at their “ends in order to prepare them for being fixed in boilers, and “I anneal them for a length of six inches at the ends which are “to enter the smoke box, and for about one and a half inches at “the ends which enter the fire box, by heating them at their ends “to a red heat to the extent above stated. By these means the “tubes will be hard and smooth externally, and they will be stiff “and strong, and give great stability to the boilers in which they “are used.”

[Printed, *Ad.* No Drawings. See Repertory of Arts, vol. 19 (*enlarged series*), p. 312; Mechanics' Magazine, vol. 56, p. 278.]

A.D. 1851, December 8.—N° 13,848.

GARDINER, PERRY G.—This invention relates, first, to a process of forming or shaping railway carriage wheels and other articles of metal by means of rotating dies and swages, which are

forced together upon the iron which is in a heated state, the dies or swages respectively revolving in opposite directions, which has the effect of so drawing or working the heated metal as to cause its fibres or grain to lie in concentric rings or helical lines; the surface of the article produced is made very smooth and regular, and a wheel wrought and swaged into a solid mass without a flaw is produced ready to be fitted upon the axis after boring.

The object of the other part of the invention relating to the manufacture of lead pipes, is also so to work the metal during the process, that the fibres or grain shall be laid crosswise, instead of as heretofore longitudinally, such pipes being easily split by internal pressure. The mass of lead either cold or heated is placed in a die chamber which, whilst the metal is being forced or drawn out through the annular opening between the die and the end of the core mandril, is caused to revolve; this motion of the die has the effect of laying the grain or fibre of the metal transverse to the axis of the pipe, working and drawing it round and round; in this way pipes of much greater strength are produced, and the pressure required to force the metal through a die that is caused to revolve during the process is considerably diminished.

[Printed, 1s. Drawings. See London Journal (*Newton's*), vol. 41 (*conjoined series*), p. 98; *Mechanics' Magazine*, vol. 53, p. 408.]

A.D. 1852, February 13.—N° 13,971.

**MOREWOOD, EDMUND, and ROGERS, GEORGE.**—The first parts of this invention relate to coating articles of metal, and the last part to drawing pipes.

Sheets of zinc are coated with lead or its alloys, the apparatus employed in the process of dipping being described. Either one or both sides may be coated, the sheet being afterwards passed through rollers for the purpose of extending or spreading it.

Stamping or otherwise forming transverse projections and indentations respectively on the ends of coated zinc or wrought-iron gutter pipes, which so fit together as to render them stronger at the joint, and they are not so liable to leak.

Stamping and forming projections and indentations across corrugated sheets of coated or other iron adapted for covering roofs, for the purpose of joining them together.

Applying sal ammoniac or other suitable chloride and sand or other substance to the surface of sheet or other metal, previous to the coating process.

Using when coating one metal with another two kinds of metal in a molten state, one heavier than the other, the bath for the purpose being fitted with a partition.

Coating wire and other surfaces with molten metal; in this process the wire or article is caused to pass through a tube, in which to prevent oxidation there is a constant current of gaseous or other vapour.

Employing a fan or blower to draw off the products of combustion when heating baths of metal for coating.

Drawing pipes made of black iron, and afterwards coating them. These pipes are made of uncoated sheet iron. The edges of the plate when it is brought into a cylindrical form are jointed by seaming. The pipes when formed are cleansed, and then for the purpose of coating them and soldering up the seams or joints, are dipped into a bath of molten zinc or other suitable metal.

[Printed, 8d. Drawing. See Repertory of Arts, vol. 20 (*enlarged series*), p. 216; *Mechanics' Magazine*, vol. 57, p. 117.]

A.D. 1852, March 8.—N° 13,998.

PERKINS, EDWARD MOSELEY.—This invention relates to the construction of core barrels, for use in making pipes, retorts, and other hollow castings. These core barrels are made of three or other convenient number of segmental sections, which by suitable contrivances operating against inclines, are caused relatively to expand or contract for the purpose of forming with one barrel cores of different diameters, adapted to pipes varying in size. The expanding gear is fixed on a central shaft, which passes through the core and is operated longitudinally by means of a screw. These core barrels after a pipe or cylinder is made are easily removed, the diameter of the core being first reduced by the convergence of its segmental sections.

[Printed, 6d. Drawing. See *Mechanics' Magazine*, vol. 57, p. 289; *Engineers' and Architects' Journal*, vol. 15, p. 347; *Journal of Gas Lighting*, vol. 2, p. 433.]

A.D. 1852, May 8.—N° 14,117.

MUNTZ, GEORGE FREDERICK, junior.—This invention relates to the manufacture of metal tubes for steam boiler and other purposes. These tubes are made of compound metal, composed of 60 parts of the best copper, and thirty eight parts of good zinc or thereabout. The ingot out of which the tube is afterwards rolled, is cast in the form of a short tube in an iron mould with a sand core which, previous to the rolling process, is well washed out. The

interior of the ingot or tube heated to a temperature of  $212^{\circ}$  is then laved or coated with a mixture of lime water and salt for the purpose of preventing adhesion, as the tube whilst being drawn out longitudinally is flattened between rolls, which are grooved similar to those used in rolling flat bar iron. After this part of the process, the flattened tube being at a red heat, is passed through a second pair of grooved rollers, one of its ends being previously opened for the purpose of placing it on the thick end or bulb of a long steel mandril, disposed in the groove between the rollers, and projecting slightly in front. The rollers make one hundred revolutions per minute, and as soon as they nip the end of the tube on the bulb, it is drawn between them and at the same time forced on the mandril, the back end of which abuts against a fixed part of the machinery; by this means the bulb of the mandril opens the tube throughout its whole length, and in conjunction with the rollers imparts to it the desired form. Tubes thus made when straightened will be ready for use if intended for such purposes as steam boilers, and if required to be plished or made bright externally, they are afterwards drawn through dies.

[Printed, 1s. 6d. Drawings. See Repertory of Arts, vol. 29 (*enlarged series*), p. 345; Mechanics' Magazine, vol. 57, p. 416; Practical Mechanics' Journal, vol. 5, p. 235.]

A.D. 1852, June 10.—N<sup>o</sup> 14,163.

BEASLEY, WILLIAM.—This invention relates to the manufacture of metal tubes and solid forms, and to the apparatus and machinery employed. Its adaptation is described as applied to the making of twisted tubes and gun barrels, for which purpose strips of metal hollow or concave on one side longitudinally, are spirally coiled round a mandril of suitable size; the hollow side of the strip being inside comes flat to the mandril, and during the coiling process the edges naturally rise so that when coiled closely together they have the appearance of a spiral ridge, the object being to provide more metal at the seam when the edges are welded together, for which purpose in order to heat the coil, it is stripped from the mandril and placed in a furnace. When sufficiently heated for welding, a mandril, fitted with a fast and a loose collar, is pushed into the coil through an entrance at the back of the furnace; the end of the mandril being then thrust out of the furnace door is seized by a pair of tongs and drawn with the coil *upon it between two grooved rollers causing them to rotate; the coil reheated if necessary is then subjected to a process of cross*



rolling, by being laid between three rollers disposed relatively parallel in triangular position, so that the whole length of the coil is operated simultaneously by the three rollers, which revolve in the same direction, the heat of the coil whilst the edges are welding, being maintained by an atmospheric blast which, more or less hot or cold, is directed between the rollers upon all parts throughout the entire length of the tube. When tapering tubes are worked the rollers are thrown more or less out of parallel.

Another method of "jamming up" the seams of a coil, is effected by end pressure during the cross rolling process; the coil being upon a mandril is taken direct from the furnace and laid between the three rollers, the previous operation of the stationary grooved rollers being dispensed with.

Tubes, to loosen them from the mandril upon which they have been made, are placed longitudinally between two horizontal rollers revolving in the same direction.

Dies adapted for reducing tubes or bars by drawing, are formed of any convenient number of concentric rings, connected by three or more suitable stay pieces. The scoria falling between the rings produces a bar perfectly clean and free from scale.

[Printed, 8d. Drawing. See *Mechanics' Magazine*, vol. 57, p. 496; *Journal of Gas Lighting*, vol. 3, p. 30.]

A.D. 1852, June 24.—N° 14,182.

McCONNELL, JAMES EDWARD.—The primary parts of this invention relate; 1st. To arrangements in locomotive engines for surcharging or highly heating steam. 2nd. The manufacture of wrought iron railway wheels with tubular spokes. 3rd. The construction of metallic steam engine pistons. 4th. The manufacture in wrought iron or steel of engine cylinders and covers. 5th. The construction of boilers, tanks, and other vessels, and protecting boiler tubes. 6th. Securing the rails of railways; and 7th. The manufacture of hollow axles.

Boiler tubes of iron are protected either internally or externally or both, by inserting within them and by drawing over them, tubes of thin copper or copper alloyed, such thin tubes respectively in either case fitting as close as possible to the surface of the iron tube.

The process described whereby hollow axles are made, consists in longitudinally packing round a mandril, a number (six more or less) of wrought-iron bars, each bar being in transverse section

a sixth part or segment of a circle, so that when heated to a welding heat and laid edge to edge along the mandril, they collectively inclose it, their contiguous edges being immediately welded together by the pressure of a pair of grooved rollers; the mandril remaining inside is afterwards withdrawn from the tube or axle which is finished after a second heating by passing it again through the grooved rollers, the friction of which draws it over the bulb of a fixed mandril. The bearing journals are formed on the ends of the axle by the simultaneous pressure of three rollers trigonally disposed, and caused to revolve at a uniform speed by tooth wheels. By employing two sets of rollers both journals may be impressed and shaped by one operation. Tubes of uniform or of varying diameter may be produced by similar apparatus.

The journals of hollow axles may also be formed by the pressure of dies actuated by hydrostatic pressure.

[Printed, 1s. 4d. Drawings. See *Mechanics' Magazine*, vol. 58, p. 36; *Engineers' and Architects' Journal*, vol. 16, p. 73; *Practical Mechanics' Journal*, vol. 5, p. 252; and vol. 6, p. 60; *Rolls Chapel*.]

A.D. 1852, November 11.—N° 14,344,

WEEMS, JOHN.—This invention relates to the manufacture of lead, tin, copper, or other metallic pipes and sheets in continuous lengths from molten metal, by machines which are operated by hydrostatic pressure. Two machines are described, one for making strong lead and copper pipes and tubes, or "copper rollers" suited to receive engravings for calico printers, and the other for forming tubes of large diameter, which may be used as such, or slit and opened out to form continuous flat sheets. These machines, modified to produce tubes of different strength and size, are constructed after the principle of the hydraulic press, a receiver in each being mounted on the head of the ram in substitution of the ordinary table. The strong tubular mould which shapes the pipe externally is fixed vertically depending from the under side of the top or cross-head, which is connected to the bottom cylinder by suitable pillars and strong tension rods. The bottom of the mould is furnished with an annular die or ring which slides into the receiver, and the mandril which forms the internal cavity or bore stands vertically fixed to the top of the ram concentric with the mould. During the *time of working*, the mandril is kept cool by water which flows

in a continuous stream through an internal passage, and carries off the excessive heat, the cooling of the mandril being necessary, especially when the machine is employed in making copper rollers. In order to charge the receiver, the water is exhausted from the receiver beneath the ram, which is then gradually raised by the hydrostatic pressure. The lower end of the moulding tube enters the receiver as the latter rises, and the upper end of the mandril concentrically enters the moulding tube, there being sufficient annular space between them to form a pipe of the required substance; the liquid metal is thus forced upwards between the mandril and the mould in one continuous length of tube, and is cooled by a jet of water whilst passing up through the cross-head.

[Printed, 10d. Drawing. See *Mechanics' Magazine*, vol. 58, p. 495; *Practical Mechanics' Journal*, vol. 5, p. 282; and vol. 6, p. 108.]

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## PATENT LAW AMENDMENT ACT, 1852.

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A.D. 1852, October 1.—N° 108.

FEARN, THOMAS.—This invention relates to a machine or apparatus, devised for impressing or embossing ornamental designs on the external surface of tubes or bars, by means of a circumposed series of small steel roller dies, whereon the design is engraved or cut. These roller dies are mounted equidistant in bearing blocks, disposed in grooves or channels radiating from a common centre, which is to be occupied by the tube or bar under operation, and the bearing blocks being pressed upon convergently by screws, the designs on the rollers are pressed into the metal surface of the tube or bar, a mandril when a tube is under operation, being inserted therein to support the external pressure. The end of the tube or bar is then gripped by the pliers of a draw-bench and the tube is drawn through the apparatus. When it is

required to ornament in this way a tube or bar spirally, the axes of the rollers are set in the bearing blocks at an angle inclining more or less from the axial line of the tube, which whilst being drawn through rollers so placed, is either itself caused to revolve, or the apparatus which carries the rollers is allowed to rotate.

[Printed, 8d. Drawings.]

A.D. 1852, October 5.—N° 219.

**BURR, ARTHUR RICHARD.**—This invention relates to the manufacture of twisted gun and pistol barrels and to tubes generally, consisting in,—

1st. “A new method of winding up the coil for twisted barrels by passing the iron between two small rollers or spindles of unequal diameter, the smaller one of which is furnished with a fixed spiral guide to give the coil the proper direction. The inequality of the rollers causes the iron to bend round the smaller one, which effect is further assisted by its lower portion being enclosed in a case. This process may also be effected by winding the iron upon a mandrill, under the operation of three rollers, arranged in a similar manner as for straightening shafting.”

2nd. “A new method and apparatus for forging the barrels or tubes by swage tools fixed in the ends of a lever, which has a rapid reciprocating motion communicated to it by the action of an eccentric. The swage tools in the lever are adjusted to similar tools in the anvil blocks. If thought more desirable, the eccentric may communicate a direct action to the tools without the intervention of the lever.”

3rd. “The use of rhomboidal shaped iron . . . . for making the coil of twisted barrels, in order to obtain a lap joint in the weld.”

4th. “The use of very narrow rods coiled upon a hollow tube, and then consolidating the whole together, under the action of the forging machine, at a welding heat.”

[Printed, 6d. Drawing.]

A.D. 1852, October 22.—N° 487.

**SLATE, ARCHIBALD.**—This invention relates to the construction of collapsible core bars, for use in making pipes and hollow



castings. Several modifications of the invention are described and illustrated. These core bars contain a longitudinal shaft, by turning which the outer shell, which may consist of one, two, three, or more longitudinal sections, is caused either to dilate or to contract according to the direction in which the shaft is turned. Various appliances, such as eccentrics, rods, levers, yokes, inclines, and other contrivances, are fitted inside the bar to effect the change of size when the shaft is turned on its axis thereby causing the simultaneous enlargement or distension of the shell, which when required for use is covered with a thin coating of loam, and dried before it is placed in the mould. The removal of the core bar after the casting is made, is readily accomplished by turning the central spindle, and thereby causing the general contraction of the shell after which the bar is easily withdrawn. The internal mechanism necessarily differs more or less according to the number of divisional sections composing the outer shell.

[Printed, 10d. Drawings.]

A.D. 1852, October 30.—N<sup>o</sup> 586.

SELBY, GEORGE THOMAS.—This is an invention of machinery adapted to roll strips and narrow sheets of metal into such forms as are required to produce tubes and pipes, either tapering from end to end, or of two diameters, the intermediate portion tapering from one diameter to the other. This effect is produced on the strips or sheets by a pair of rollers, which by means of wedges are caused to be more or less separated whilst in operation, so that whilst a strip is passing between the rollers, their separation may be made gradually throughout the whole length of the strip, in which case the latter is made thin at one end and has a gradually increasing thickness to the other. Such a sheet would be suitable for forming a tube tapering from end to end internally. When tubes of two diameters are required, that is a uniform thickness throughout a portion of their length, and the remaining portion of increased strength, the separation of the rollers is effected almost suddenly, so that the portion of the sheet which passes through during the time the change is made is a regular taper or incline from one diameter to the other. The tubes made from these sheets are, according to the drawing, parallel externally, and consequently the variation in the thickness of the sheet causes a

corresponding diminution in the size of the bore. The rolling machine appears to be self-acting after the necessary adjustment is made.

[Printed, 8d. Drawing.]

A.D. 1852, November 11.—N° 707.

PROSSER, RICHARD.—(*Provisional protection only.*)—This invention has for its object the manufacture of tubes by drawing out or elongating cast metal ingots which are square in transverse section and have severally a hole of similar form through them from end to end, the angles both inside and outside being rounded off. A tubular ingot so formed is placed upon a suitable mandril and passed between rolls, having the same configuration as the rolls which are employed for rolling iron into square bars during the process of manufacture; by this means the ingot is gradually elongated, and finally is reduced transversely and lengthened out to the dimensions required, the metal being operated upon either in a heated or cold state, as its nature may require. The ingot by this means is brought into the form of a tube still retaining its square form with rounded corners, and this form is subsequently altered by passing it between rollers which have circular grooves.

[Printed, 4d. No Drawings.]

A.D. 1852, November 12.—N° 724.

SEATON, CHARLES.—This invention relates to the process of manufacturing tubes from copper, brass, or other metallic ingots which are cast cylindric and slightly tapering at one end. These ingots are compressed and lengthened out whilst passing through grooves formed in a series of pairs of revolving rolls, which are similar to the rollers used for rolling round iron rods under the process of manufacture. During the process, the tube is supported internally by a mandril or mandrils fixed at both ends in a line with and passing through the grooves in the several pairs of rollers, which are disposed in a direct line, one pair behind another, all the rollers being relatively parallel, and the grooves graduating in size, those in the front pair of rolls having the largest diameter. The ingot cleansed from the sand and reheated, is placed on the front end of the mandril and pushed

forward to the revolving rolls, which bite the end of the ingot and gradually elongate and draw it along the mandril, which is slightly reduced in diameter at that point where the rollers first take effect. The several pairs of rollers are furnished with a corresponding number of grooves, which graduate in size in each roller, and also in each pair, and in each groove there is laid a fixed mandril, which extends through the series of pairs of rolls, and gradually tapers towards the after end, where the process is finished by the rollers of the last pair.

[Printed, &c. Drawing.]

A.D. 1852, November 15.—N<sup>o</sup> 748.

**DUMÉRY, CONSTANT JOUFFROY.**—This invention relates to the manufacture of pipes and tubes, and to the various machinery and apparatus employed for the reducing, lengthening, and finishing processes. It comprises apparatus for :—

1st. Polygonal rolling; helical rolling; polygonal helical and circular hammering; and pressure in lieu of traction.

2nd. A new continuous rectilineal drawing; a drawing bench with varied course and multiply operations; a return apparatus for the mandrils.

3rd. "Unmandrilling" by rolling or by drawing; "unmandrilling" by pressure or percussion; an unfastening apparatus.

The machine first described and illustrated is termed a "polygonal laminating apparatus," which acts upon the tube by means of a circumscribed series of sixteen disc rollers, that operate simultaneously by pressing radially on the tube to cause its elongation, the axes of the rollers being transverse to the axial line of the tube.

A "helical laminating apparatus," in which the axes of a circumscribed series of radial pressing rollers are severally disposed at angles slightly deviating from a right angle to the axial line of the tube, so that the trail of each roller describes a close helix winding round the tube as the latter passes through the apparatus.

A laminating machine, which operates upon the tube by means of a circumscribed series of sixteen radial acting hammers, the tube occupying the common centre in the direction of which they act simultaneously either by percussion or by pressure.

The mode and apparatus employed for drawing out or reducing and lengthening tubes, which are placed on a mandril and may be

either drawn or pushed through the dies or draw plates, which are jointed and connected either by a ring or external collar. The chief novelty is the mode of working by forcing out. "Two tubes may be mounted upon the same mandril, whilst two draw plates meeting them both, laminate each of them; in which the draw plates may be fixed, and the mandrils forced into the draw plates, either from left to right or from right to left; that is to say, in going to and fro, to avoid loss of time, and to manufacture with double effect."

The second part of the invention comprises machines for continuous rectilinear drawing, by means of a series of rollers disposed equi-distant on a horizontal plane, and acting on the tube by compression or pressure; a multiple drawing bench for various lengths; and an apparatus for returning the mandril, thus saving the labour of the workmen.

The third part comprises the unmandrilling apparatus, which loosens the tube on the mandril after it has been subjected to the laminating and drawing processes. This apparatus operates by means of two series of rollers which respectively act upon the tube in opposite directions.

[Printed, 1s. 6d. Drawings.]

A.D. 1852, November 22.—No 819.

ROOSE, JAMES.—This invention relates to a method of welding iron tubes, for which purpose is employed a bell-mouthed die, which is suitably mounted on a draw-bench. The process consists in first placing one end of a long strip of iron, which has been reduced to the proper size for forming a tube, in a muffle or small furnace, and when at a red heat it is withdrawn, and bent by hammering into form for entering the mouth of the die. The strip is then placed in a long welding furnace, and when it has attained a uniform welding heat, it is taken out and immediately drawn through the die, which is placed in a suitable position on the draw-bench, a fixed mandril which is passed into the die, may be used to give internal support when desirable; by this means the strip of metal is made to assume the cylindric form of a tube, the two edges being welded together by the compression of the die as the strip passes through. Tubes intended to be fluted are reheated and subjected to a second operation of drawing *through a second die*, which has the necessary internal configura-



tion, and tubes of other transverse contour, are produced by dies of corresponding internal form.

[Printed, 8d. Drawing.]

A.D. 1852, November 26.—N° 870.

HOBY, JAMES WARD, and KINNIBURGH, JOHN.—This invention relates to the casting of metal in moulds made of fire-clay either alone or mixed with other substances, and burnt before use. When not used alone, the fire clay may be mixed either with sand, grit, and plumbago, common clay, and other suitable substances, and when moulded is treated after the manner of burning fire bricks in a kiln. "The clay is thus deprived of its plastic nature, and caused to cohere with much greater strength than if it were merely dried in lieu of being baked. The mould is, in fact, a piece of brick, and much better adapted for sustaining the sudden contact of hot fluid metal than the dry clay or loam ordinarily employed. The moulds may either be made entire, or in pieces carefully fitted together, and their faces may be made smooth before the burning, or they may be made smooth by grinding and rubbing after they have been burnt or baked. The surface of the mould is washed over with a mixture of plumbago and water, which is dried or allowed to dry, and the mould (when of more than one piece) is put together, and the liquid metal poured into it. A small quantity of lute or plastic clay may be placed between the junctions of the different parts of the mould. When the metal has solidified, the mould is separated, and the casting is removed. The mould is then washed over again with plumbago, and put together again, and another casting is made in a similar manner."

Moulds for casting pipes are made longitudinally in halves, which when placed together are secured by clamps or straps with bolts and nuts; previous to use the inside of the mould is heated by a current of hot air or by other convenient means, and is then brushed over with a wash of plumbago in water, the core is adjusted, and the gate box, which is lined with sand and fitted to the top plate, is attached; the metal is then poured in, and when cool the core and pipe are lifted out together.

[Printed, 6d. Drawing.]

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A.D. 1852, December 9.—N° 1008.

BADDELEY, WILLIAM.—(*A communication.*)—This invention relates “to the manufacture of pipes from lead, tin or pewter, by  
“ forcing the metal, in a melted or fluid state, through dies  
“ suitably formed and arranged. For this purpose a single or  
“ double barrel force pump is immersed in a bath or cistern of  
“ melted metal, the working of which pump forces the metal up  
“ through a suitable die (of the exact dimensions internally and  
“ externally of the required pipe), which conducts it so far into  
“ the atmosphere, or through a cold water bath, as to cause the  
“ upper end of the metal to issue from the die in the form of a  
“ a solid pipe while its lower end is in a fluid state; so that, as  
“ long as the action of the pump is continued and the supply of  
“ metal is kept up, a pipe of the required size and any required  
“ length will be produced.”

[Printed, &c. Drawing.]

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## 1853.

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A.D. 1853, January 6.—N° 35.

CHAMEROY, EDMÉ AUGUSTIN.—This is an invention of a metallic compound capable of fusion, and of being cast into various forms, such as statues, columns, wheels, and plates which may afterwards be rolled and made suitable for covering roofs, manufacturing tubes, tanks, and other useful purposes.

The chief ingredient of this compound is iron in fine particles, such as pounded ore, or cast iron reduced to that state, and mixed with a soldering metallic alloy, such as either tin, lead, zinc, or bismuth, where two or more of them are amalgamated. The particles of iron before use are cleaned by steeping in a solution of ammonia, chlorine, or other preparation capable of acting on the metal. The metallic proportions of the compound are 4 parts of iron to 1 part of the soldering metal which is first put into a melting pot or crucible and placed in a furnace; when the metal is reduced to a state of fusion, the prepared iron particles are thrown in, and

stirred until each particle is thoroughly coated or tinned, care being taken so as to regulate the heat, that oxidation does not ensue; the compound mass is then fit for use.

[Printed, 4d. No Drawings.]

A.D. 1853, January 17.—N° 110.

POTTS, THOMAS, and COCKINGS, JAMES SEPTIMUS.—This invention relating to the manufacture of copper and other tubes, and to their use and application, consists:—

1st. In making tubes for locomotive boilers and other purposes out of heated cast tubular ingots, which are triangular in transverse section, the angles being rounded off. These ingots are lengthened and reduced by passing them in a heated state between three disc roller, and afterwards at a draw-bench drawing them through a succession of dies, a mandril suited in form to afford the necessary internal support, being placed inside the tube during the operation.

The disc rollers are mounted on axes which revolve in bearings so disposed, that each axis forms one side of an equilateral triangles, causing their peripheries (which are suitably shaped) to meet and form a central opening, and when set in motion, they act collectively on the ingot as a revolving die. Two sets of rollers are employed, the peripheries of one set being plain, act first upon the ingot, and the other set which act next are grooved, and impart to the ingot a form somewhat approaching circularity, both sets lengthening out and reducing the ingot transversely until it assumes the form of a tube, which is finished and made circular by passing it through a circular die at a draw-bench.

2nd, relates to the making of copper rollers for calico printing purposes out of flat metal, which is bent and worked into a cylindrical form by first hammering and swaging, and afterwards by rolling and drawing, the edges, which are planed to true surfaces meeting against an interposed strip of copper that is brazed in, and projecting inside, forms the key or feather which fits into the groove of the mandril.

3rd. Applying fine hollow tubing for the purposes of telegraphy, instead of the solid wires in general use.

[Printed, 8d. Drawing.]

A.D. 1853, March 5.—N° 560.

BROOMAN, RICHARD ARCHIBALD.—(*A communication.*)—This invention relates to machinery or apparatus designed for making metal pipes by a series of disc rollers, so mounted in a frame round a common center, that their several axes are tangent to a circle struck therefrom, consequently their peripheries, which are grooved, are directed to that point, and collectively form a circular opening, each constituting a segmental division thereof. The tubular ingot, which is to be lengthened and gradually reduced, is placed on a mandril, and passed through this opening, which at the beginning of the operation is enlarged; it is gradually caused to diminish in size after each pass of the ingot, until the opening becomes a perfect circle, and the ingot has become a tube, of the length and diameter required. The bearings wherein the axes of the disc rollers are mounted slide in radial grooves, and they are caused to converge towards one common center by means of set screws.

Large ingots are reduced and lengthened out to form tubes of small diameter, by passing them through a succession of apparatus, until the required size is attained. The necessary smooth finish is given to the surface of the tube by drawing the latter through a dead steel die.

[Printed, 10d. Drawings.]

A.D. 1853, March 22.—N° 701.

JOHNSON, WILLIAM.—(*A communication.*)—This invention relates to the construction of apparatus designed for the rolling and shaping of metals, and adapted to the manufacture of railway wheels, rings, cylinders, tubes, and other articles. It is described and shown as applied to the process of rolling and forming a solid railway wheel, the mass of metal for which is taken at a proper heat and laid upon a revolving table, the upper side or surface whereof has the form of one side of the wheel; two pressing rollers, independently revolving on horizontal axes, and mounted to revolve in suitable bearings, are placed above, one on each side the vertical center of the table and in radial position therewith. These two rollers are by means of suitable gearing caused to revolve in opposite directions, and their office is to roll and press upon, and thereby shape the upper side of the wheel. Other rollers of suitable form for shaping the tyre,



are circumposed to press thereon in a horizontal direction, the whole arrangement by suitable gearing being contrived to act simultaneously. For each different article produced a special modification of the machine would be required.

[Printed, 6d. Drawing.]

A.D. 1853, March 24.—N° 718.

KEATS, WILLIAM.—(*Partly a communication.*)—This invention relates to the manufacture of tubes from copper, brass, and other alloys of soft metal, and is in part applicable to tubes made of iron; also to the construction of a compound mandril.

The metal is prepared in the form of a cylindrical ingot, which is cast not less than half an inch thick upon an iron mandril, made slightly tapering in order that it may be started as soon as the copper or other metal of the casting begins to set, the size of the mandril being larger than the intended finished size of the tube. The ingot, placed on by preference a hot mandril, is lengthened out and reduced by a succession of passes between rollers furnished with a graduating series of grooves, the ingot being previously placed with the mandril in a furnace, until both acquire the proper degree of heat, and at intervals during the operation the ingot is reheated to restore the degree of temperature most suited to the successful working of the process. Rollers in pairs or three in a set and furnished with paracentric grooves, are employed for rolling tubes in either a heated or cold state.

A compound mandril consists of a central shaft or axis, covered by three longitudinal segmental sections, which are capable of being tightened up by a wedge or tongue.

[Printed, 6d. Drawing.]

A.D. 1853, April 19.—N° 942.

CHATTERTON, JOHN.—This invention relates to a method of coating tubes made of gutta percha, india-rubber, or of such substances combined, with lead or soft metal. To effect this a thin tube, made in the ordinary way of lead or soft metal, is used to form the external covering or coating, and should be of sufficient size interiorly to receive and permit the gutta percha pipe to slide in. When the two are thus disposed the one with the other, the combined tube is either drawn through a circular die, or

passed between suitably grooved rollers, which have the effect of reducing the diameter of the lead or metal pipe, and cause it to shrink and close into intimate contact with the surface of the gutta percha or other tube within. This the inventor states "is a new manufacture of tubes applicable to various purposes."

[Printed, 4d. No Drawings.]

A.D. 1853, April 27.—N° 1010.

HETHERINGTON, JOHN, DUGDALE, JOHN, the younger, and DUGDALE, EDWARD.—The object of this invention relating to a system of "plate moulding," is to simplify the manner of constructing, and to reduce the cost of the models or patterns which are produced in accordance with the method described in the Specification of Letters Patent granted February 10, 1851, No. 13,499, to Peter Fairbairn and the above John Hetherington. The method referred to, consisted in fixing the two halves of the pattern or patterns upon the opposite sides or surfaces of a metallic plate, the position of the half on one side being exactly coincident with the half on the other. According to the present invention the trouble and the expense of fixing the halves of the patterns on the opposite sides of a plate is avoided. The pattern as ordinarily prepared is handed to the moulder, who proceeds to carefully mould it as usual in a pair of common moulding boxes. Before casting in the metal, the two boxes are slightly separated, a distance equal to the thickness of the plate employed in the original process, the margin all round the thin space thus formed between the meeting surfaces of the sand being closed, so as to prevent the escape of the metal when it is poured in, the cavity of the mould consisting of the impression of one half portion of the pattern in the sand of one box, and the impression of the other half in the sand of the other box, and between the parting surfaces of the sand in the two boxes a thin space. When the casting is made, the metal in the space forms a plate to which the two halves of the pattern are attached, one half on each surface and all in one piece. The model pattern is then laid aside, and this casting when dressed up and smoothed, is used for plate moulding after the manner described in respect to the original invention.

The preparation of the moulds for casting pipes and circular bodies consists of a plate with an opening, in size a trifle larger than a longitudinal section of the pipe cut through its center; the

pipe pattern is furnished with a projecting axis at each end, and when it is laid in the opening of the plate, exactly one longitudinal half of the pattern is seen above its upper surface. In this position it is capable of being turned on its axis, and the half moulds are made from it in moulding boxes or flasks which pair together, and make perfect moulds, the model pattern in each case being turned on its axis to loosen the sand from its surface before the flask is lifted off.

[Printed, 8d. Drawings.]

A.D. 1853, May 9.—N° 1136.

LAW, DAVID, and INGLIS, JOHN.—This invention of apparatus designed for forming the moulds employed in casting metals, is more especially useful in the moulding of pipes and such articles as are parallel or nearly so throughout their length. The mould box whilst the mould is being formed within it, is placed in an upright position upon a rotating turntable, and the pattern employed comprises only a short portion of the length of the pipe or article about to be moulded. The external diameter of this short pattern corresponds with the full size or diameter of the intended casting, and as the moulding process proceeds, the pattern, which is at the bottom of the mould box at the beginning of the operation, is gradually raised, being guided upwards in a direct vertical line by suitable contrivances, whilst the sand which falls into the mould box from above, is rammed and consolidated round the pattern by an annular rammer, which, as the operation proceeds and the mould box gradually fills, has the necessary up-and-down motion imparted to it by the mechanism above. The pattern is guided upwards by the passing of the rod whereto it is attached through the hollow spindle of the rammer, which independently of the rod is slowly caused to rotate, and the upward movement of the pattern is regulated to keep pace with the progress of the work, the mould box slowly revolving with the turntable during the operation.

[Printed, 8d. Drawing.]

A.D. 1853, May 10.—N° 1143.

CLAPHAM, JOHN, CLAPHAM, THOMAS, and CLAPHAM, WILLIAM.—This invention relates to the construction of the flasks or mould boxes employed for casting metallic pipes in loam or

green sand, to the tools or apparatus employed for ramming or striking up the sand, and to the mode of casting.

The flask or mould box is made of metal in two semi-cylindrical longitudinal halves, which have flanges projecting along each side for the purpose of bolting them together with screws and nuts. The meeting surface of each half mould is planed or otherwise made true, in order that the two when brought together may make a sound union, and through the shell of each the metal is perforated at irregular intervals all over, to permit of the escape of the vapours and gases which are generated when the molten metal is poured into the sand, the ends of each half mould being suitably formed to receive an annular flange or collar, and pair together, some for casting pipes with flanges, and others for pipes with sockets; the interior of these moulding boxes have a thin lining of sand, which is made to cohere to all parts of the internal surface of each half, by means of a great number of short cast metal studs, which are formed in the casting when the parts of the box are made, the object being the capability of casting three or four pipes in succession, without deranging or re-forming the sand lining of the mould. The tool employed to form the interior or semi-circular cavity in each half of the mould is fitted to slide along the planed surfaces of the side flanges; it closely presses the sand amongst the metal pegs with which the interior of the mould is studded, and forms and imparts to the interior a smooth surface.

The cores are made on a core barrel suitably formed at the ends to fit the collars and correspond with the ends of the mould boxes, which are variously shaped in accordance with the required form of the pipe ends, whether flanged or otherwise.

[Printed, 1s. Drawings.]

A.D. 1853, May 23.—N° 1273.

JOHNSON, JOHN HENRY. — (*A communication from Messrs Laforest and Boudeville.*)—The object of this invention is an improved mode of constructing the ends of pipes intended to be connected together, and the manner of forming the junction. To this end, the means devised consist in sinking into the meeting surface or face of the flange at both ends of a pipe a **V**-formed groove or recess, which is made uniform in size and depth in both ends of all pipes intended to be connected, so that



when the ends of any two pipes are placed together, the grooves exactly coincide. The intermediate packing employed is in the form of a ring made of soft metal, lozenge shaped, in transverse section, for the purpose of fitting into the groove in both pipes when their meeting surfaces are brought together; when tightened up by means of such bolts and nuts as are ordinarily employed for the purpose, the ring is squeezed into the grooves, and forced into intimate contact with their inclining sides. "In place of a detached conical ring or packing piece . . . the junction may be effected by forming such packing piece in one piece with one of the flanges, the corresponding flange being grooved or recessed to receive it. In bolting up the effect will be the same as before described, the projecting packing piece being squeezed into the conical groove or recess on the face of the other junction surface, and is thereby caused to adjust itself to the exact form of the groove in which it is fitted."

[Printed, 6d. Drawing.]

A.D. 1853, June 10.—N<sup>o</sup> 1420.

FRANKHAM, SAMUEL.—The object of this invention relating to coupling or connecting the ends of pipes to make a continuous length, is the formation of a water-tight junction that will yield to the longitudinal expansion and contraction of the pipes, and not slip out of position. Each pipe is formed alike; in one end which is enlarged externally there is a deep annular recess, wherein is placed an india-rubber packing ring, which when two pipes are laid together in a direct line is pressed upon by a ring flange which projects forward from the opposite end of the other pipe, and fits loosely into the annular recess; suitable lugs with bolt holes are cast in each end, and when the pipes are placed in position, they are drawn together by bolts.

Illustrations are given and modifications of the invention described showing its application to general purposes.

[Printed, 6d. Drawing.]

A.D. 1853, August 31.—N<sup>o</sup> 2024.

GRAZEBROOK, JOHN PHILLIPS.—(*Provisional protection only*).—The object of this invention is to improve the iron tubes employed for the working barrels of pumps, by lining them "with

“ tubes of flint glass in place of the ordinary *limer* coating of  
“ copper, the glass barrel having a flange formed on one end  
“ that fits into a corresponding socket in the end of the metal  
“ tube, and this glass barrel having several horizontal grooves  
“ cut on its outer surface to afford a hole for the cement, with  
“ which I attach the glass to the metal tube. In the same  
“ manner I can line metallic tubes other than those intended for  
“ the working barrels of pumps.”

The invention is also applicable to the lining of other metallic cylinders and tubes.

[Printed, 4d. No Drawings.]

A.D. 1853, September 7.—N° 2058.

LAW, DAVID, and INGLIS, JOHN.—This invention relating to the manufacture of cast metal pipes, refers more particularly to the core bars employed in the process.

These core bars are collapsible, “ being composed of a series  
“ of longitudinal pieces of curved metal or segmental pieces,  
“ capable of forming bars of various diameters, by being set in  
“ a circular form with their longitudinal wedge-shaped or sloped-  
“ off edges overlapping each other. Down the centre of these  
“ pieces is a longitudinal spindle carrying upon it at intervals  
“ screw threads or portions of screws fitted with nuts carrying  
“ joint eyes or lugs. Each nut may have four lugs, from which  
“ short links or connecting rods pass to similar joint eyes in  
“ the interior of each of the pieces composing the core bar.  
“ These links are contrived to have an angular elbow-joint  
“ action, so that as the nut is made to traverse along the spindle  
“ by turning the latter round in either direction the line of the  
“ angle of each link in reference to the axial line of the central  
“ spindle will be correspondingly varied, and hence the curved  
“ external pieces of the core bar will be drawn in towards or  
“ directed further from the centre of the core bar, as the case  
“ may be, that is to say, when each link stands at a right angle  
“ with the axis of the central adjusting spindle on which the  
“ nuts are placed the curved external pieces of the core bar are  
“ expanded to their utmost range. On the other hand, as the  
“ nut is traversed back upon its spindle, the links form a more  
“ or less acute angle with the axis of the spindle and with the  
“ internal faces of the curved core bar pieces, and thus the latter

"are drawn more or less towards the centre from which they radiate. The curved pieces forming the acting portions of the core bars may be variously arranged in combination, and they may be of various shapes, instead of being simply curved, but they are in each case worked by the angular action of the traversing nut links or elbow joints. By this means the founder can produce articles of various diameters from a single core bar, which he can accurately adjust to any diameter required."

[Printed, *sd.* Drawing.]

A.D. 1853, September 20.—N<sup>o</sup> 2181.

POTTS, FERDINAND.—This invention relating to the manufacture of taper tubes, and to the apparatus employed, consists in,—

1st. The mode adopted for cutting and shaping the sheet of metal, without first setting out and scribing the required dimensions upon it. For this purpose a pair of circular shears are employed, to which are adapted suitable contrivances for securing and moving the sheet to a regulated angle, according to the desired size of the tube and the amount of taper required.

2nd. Apparatus for rounding, levelling, and finishing taper tubes, taken in the rough state after the process of malletting into form and soldering the seam. This apparatus has somewhat the appearance of a turning or slide lath; the tube is placed upon a tapering mandril, which at its thickest end is attached to the machine spindle, the mandril lying throughout its whole length in a V-formed trough or angular groove. The effect on the tube is produced by a pressing tool, which also acts as a burnisher; this tool is carried by a lever, the short end of which is affixed to the lower half of a coupling nut, which embraces a strong screw mounted in bearings in a position when revolving, to conduct the pressing tool along the upper surface of the tube; the screw and the main spindle are geared together, so that both revolve, the tube making a completion revolution whilst the pressing tool moves along the machine a distance equal to one turn or pitch of the screw thread, the experienced judgment of the attendant being required to regulate the pressure on the lever and conduct the operation.

[Printed, *sd.* Drawing.]



A.D. 1853, October 1.—N° 2242.

COATES, CHARLES.—This invention relates to the coupling or connecting flanged and other pipes, cylinders, and other articles, and consists in interposing between the meeting faces of the flanges on the ends of pipes and cylinders, a leaden ring, oval, circular or angular in cross section, which ring when the flanges are drawn together by bolts in the usual manner, is compressed and brought into intimate contact with all parts of the meeting surfaces. Pipes with a conical socket at one end and a tapering spigot at the other, are also packed with leaden rings, and drawn together by bolts, to receive which, suitable projecting ears or lugs are cast on the pipe ends.

Moulds in which the rings are cast are made in two half parts, and formed or cut in the meeting surface of each is a concentric series of semi-circular, semi-elliptic, or angular grooves, each half part corresponding with the other, the two being fixed together face to face by a central bolt, and the grooves being all put into communication by suitable channels or runners, so that when the melted metal is poured in, a series of rings are cast together, suitable for use when separated in connecting various sized pipes.

[Printed, &c. Drawing.]

A.D. 1853, October 20.—N° 2421.

RUSSELL, WILLIAM.—This invention relates to the manufacture of copper tubes, the substance of the metal of which during the process, is first thinned and afterwards thickened; also to the expanding of tubes. The tubes are made by drawing a cylindrical piece of copper or tubular ingot through a succession of dies or burrs, in order to lengthen it but not in the first instance to materially lessen its diameter, altho' by this part of the process the metal is proportionately reduced; and in order to thicken it again, the diameter of the tube is reduced to the required size by drawing it through a succession of dies severally graduating to a small diameter. This second process gradually lengthens the tube, diminishes its diameter, and thickens the substance of the metal. An ingot containing the requisite weight of metal, and something over to allow for trimming off and

finishing, may be drawn out to the length of a little over 27 feet, to be afterwards cut up into nine foot lengths or otherwise.

Tubes are expanded circumferentially by drawing through them a conical or other suitably formed collar, which is fixed on the end of a metal rod; if the collar is formed with a series of facets on its largest end, the tube is caused whilst being enlarged to take a polygonal shape, but its cylindrical figure may be restored by drawing through it a collar of a conical form. Instead of a draw-bench with the necessary dies or burs, rollers properly grooved may be employed for the purpose of extending and reducing the tubes. It is stated that tubes subjected to the last thickening process, are sounder, denser, and stronger than tubes made by the ordinary process.

[Printed, 4d. No Drawings.]

A.D. 1853, October 24.—N° 2450.

YOUNG, JAMES DENOON.—This invention relating to the process of casting metals is, it is stated, peculiarly applicable to the manufacture of pipes, columns, and hollow castings. It consists,—

1st. “With reference to castings not requiring to be chilled or “hardened, in a mode or modes of applying hot water and steam “or vapour to the moulds or patterns, and in some cases to the “cores used in such casting, in order to preserve them from “becoming red hot, warped, or fused by the melted metal or “other substance run into or upon them, and also to improve “the quality or texture of such substance when cast into the “required form, by preventing the chilling or hardening thereof “while in the moulds.”

2nd. “With reference to castings requiring to be chilled or “hardened, in applying cold water to the moulds or patterns, “and in some cases to the cores used in such casting, for the “purpose of chilling and hardening such castings as required.”

The hot water and the steam, or the cold water, as the case may be, whether the castings are to be chilled or otherwise, is to be applied externally to the moulds, and by means of suitable pipes internally to the cores, through flexible connections.

A memo. of alterations disclaiming all that is described under the second part of the invention is appended to the specification.

[Printed, 8d. Drawing.]



A.D. 1853, November 30.—N° 2784.

DAVIS, EDWARD KEATING.—This invention relates to a variety of machinery and apparatus for making pipes, sheets and other articles from soft metals, such as lead, tin, zinc, and bismuth, and such alloys of soft metals, as are capable of being forced through dies, consisting in :—

1st. An improved hydraulic press with double action acting alternately on two metal containers respectively complete with dies and cores for making pipes or sheets.

2nd. An arrangement of apparatus for lining lead or other soft metal pipes with tin during the process of manufacture.

3rd. A modification of the above compressed air being employed to act between the piston and the surface of the metal.

4th. An arrangement of machinery for making pipes of soft metal whilst in a fluid state. In this case both the die and mandril employed are unusually long, in order that the metal pipe before it issues and leaves the die and mandril may have time to set.

5th. A similar arrangement to the last, adapted to making sheets, the metal container and die plate being modified in form.

6th. Adding to the last arrangement an apparatus for tinning or coating the sheets, and thereby combining the two operations.

7th. An arrangement of machinery for making lead or other soft metal pipes from solid metal, by the pressure of two or three hydraulic presses worked by one set of pumps.

8th. Adding to the above a tinning apparatus whereby to combine the two operations.

9th. A modification of the seventh arrangement, designed for making sheets from metal in a semi-fluid state.

10th. Accurately fitting a strong copper packing round the iron piston which forces the fluid or semi-fluid metal out of the container in order to avail of the different rate of expansion in the two metals, and thereby prevent the escape of the fluid metal.

11th. Constructing the metal containers of pipe making apparatus with an overflow aperture.

12th. A double die to be used when coating pipes externally, the pipe being formed by one section of the die, and coated whilst passing through the other.

13th. Casting the cast-iron metal containers of pipe making apparatus upon wrought iron cylindrical linings.

14th. A new mode of making worms for stills.

15th. Lining lead or other soft metal pipes with gutta percha or caoutchouc, alone or combined with each other, or with other materials.

[Printed, 1s. Drawing.];

A.D. 1853, December 29.—N° 3015.

ESTIVANT, EDWARD.—(*Provisional protection only*).—"This invention has for its object the manufacturing of brass tubes by hammering, in place of drawing the same through dies, or rolling them between grooved rollers, as heretofore practised. For this purpose the tubes, as heretofore, are cast in suitable lengths, and are then extended in length by hammering the exterior surface, there being an interior support below the hammer. A tube is by the machinery, constantly moved slowly forward under the hammer, and at the same time it is caused to revolve, by which the tube will be extended in length. The tube is then annealed, and again subjected to the process of hammering, and these processes are repeated till the tube has been extended to the desired length."

[Printed, 4d. No Drawings.]

A.D. 1853, December 29.—N° 3017.

RÉMOND, AMÉDÉE FRANÇOIS.—This invention relates to the manufacture of corrugated metallic tubes, by passing sheet metal through or between suitably grooved rollers, and then closing and securing the longitudinal joints by soldering, rivetting, or welding, according to the nature of the metal employed. The corrugations run round the tube transverse to its axis, and two plates are required to make a moderate sized cylinder, they being rolled in half circles, with the addition of sufficient metal to form lap joints, which are preferred for tubes that are circular in transverse section, and butt joints with flanges for those tubes which are elliptical. Instead of corrugating and forming the semi-cylindrical plates by rolling, other means for bending them to the required form may be employed. Corrugated tubes of copper or brass and other alloys are closed by soldering, and tubes of sheet iron are rivetted or welded.

Tubes of large diameter are made in three or more sections segmentally curved and corrugated by the process.

[Printed, 4d. No Drawings.]

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1854.

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A.D. 1854, January 3.—N° 9.

MADELEY, JOSEPH.—This invention relates to the making of tubes applicable to the manufacture of hexagonal or other form of nut-blank or bolt head, and to various other purposes. These tubes are made cylindric inside, and hexagonal or of other prismatic form externally, and for general or specific purposes they may externally have the form of a cylinder, or be fluted or otherwise ornamented. The tubes are made longitudinally in halves, or in longitudinal sections to form half lap joints, out of suitable bars of iron, rolled with a half circular groove along the center of one side, so as to leave a margin on each side of the groove, the other or outside having transversely a semi-hexagonal figure. When the plain margins of the grooved side of two bars are placed face to face, and welded together by drawing or rolling, a tube is formed suitable for the purpose of nuts and bolt heads; tubes of other transverse form may be produced in the same manner, and tubes for gas fittings and similar uses may, in the rolling and welding process, have formed on them lateral projections and feathers. When used for nut blanks and bolt heads, the tubes are cut up transversely into short pieces of the required size.

[Printed, 6d. Drawings.]

A.D. 1854, January 12.—N° 81.

ANGER, LEON JOSEPH.—(*Provisional protection only.*)—This invention relates to the manufacture of metallic tubes, applicable to locomotive and other purposes, where greater strength and power of endurance is required at one particular part, or at that end of a tube which is exposed to more wear, and is placed contiguous to the greatest heat. The tubes are made from short cylinders, which are drawn out or elongated on mandrils, made to the full length of the finished tube. The machinery employed

operates by means of hammers, that fall alternately on the tube, which is caused to move forward and at the same time rotate, and by this means every part of the short cylinder comes by turns under the operation of the hammers. When passing over the end or ends, or other parts requiring additional strength and substance, the force with which the hammers strike is moderated. In some cases the ends or parts of tubes may be shielded by soldering, or brazing pieces upon them.

[Printed, 4d. No Drawings.]

A.D. 1854, January 12.—Nº 86.

MACLAREN, ROBERT.—This invention relates to the application of hydrostatic or other pressure upon the sand or loam employed in the making of moulds, instead of acting upon the moulding material in the usual way by rammers.

"The mould box may be of the usual form with cross bars for holding the sand or loam together, but the bottom is in a separate loose piece just fitting within the sides of the box, and the bars do not reach the lower edge of the sides, so that the bottom may be raised to a limited extent inside the box. The lower mould box is placed in a hydrostatic press and is filled with sand or loam, and the pattern is then placed in position. The upper mould box is then placed above the lower one, and is likewise filled with sand or loam. This upper box is also formed with a false bottom and in similar manner to the lower one, but is placed in a reverse position in reference thereto. The boxes being filled with sand, which may be conveniently affected from a sand hopper placed at the top of the press, the hydrostatic pressure is applied and is made to act entirely between the false top and bottom of the mould box, and produces a degree of compression proportionate to the extent to which the top and bottom are driven in, whilst the sand or loam is forced with an equal pressure on both sides of the pattern. When the pressure has been given and the moulding force is released, the upper or reverse mould is hooked or suspended from the fixed framing, so that as the pressing movement returns, the upper or reverse mould is left behind. This uncovers the pattern or core, which is then removed by the continued back traverse in a similar way, and the completed mould can then be at once run off to its destination. This method of forming



" moulds is more particularly applicable to patterns of slight depth and to such patterns as are in the form of castings having the patterns in one piece on a flat plate."

The mould for a pipe core " is made in two or more pieces in such a manner, as when submitted to the requisite pressure, they may close together and form the required shape of core, without allowing any of the sand or loam to escape." " This system of moulding is particularly suited for working on the principle of the plans already patented by Messrs. Fairbairn, Hetherington, Dugdale, and Jobson."

[Printed, 10d. Drawing.]

A.D. 1854, January 26.—N° 196.

REEVES, CHARLES, junior, and WELLS, WILLIAM. — The object of this invention, which relates to a mode of casting metals, is to obtain castings more sound and uniform than are produced by the ordinary process. The method of working is described as applied to the casting of hollow cylinders for making tubes and for other purposes. The moulds employed are made in two halves or more sections, and are placed in a vertical position. Up the side of the mould there is a slotted opening, wherein is fitted a bar, which fills the opening and is capable of sliding freely up or down, so as to prevent the escape of the metal as it rises in the mould. When commencing to pour in the metal, the top end of the bar is near the level of the bottom of the mould. The metal is poured in through the slotted opening over the top of the bar, which gradually rises as the mould fills, and by this means the metal is made to run smoothly into the mould, free from air bubbles and unusual disturbance. Instead of causing the sliding bar to rise, it may remain immovable, and a downward movement be imparted to the mould, so that the pot or crucible whence the metal flows would remain at a fixed level and merely require tilting, otherwise, when the mould is stationary, it has to be raised with the bar. The invention may (with modifications) be adapted to the casting of many other articles besides pipes, tubes, and cylinders.

[Printed, 8d. Drawings.]

A.D. 1854, January 30.—N° 225.

COOPER, JOSEPH ROCK.—(*Provisional protection only.*)—This invention relates to preparing and dressing rolls for rolling gun barrels and other tubes and bars; it is described as follows:—

"In rolling gun barrels, tubes, and bars of circular section, and of taper or conical form, it is necessary to form grooves of corresponding form in the rolls. In lieu of turning these grooves in a lathe, and returning them again when they require dressing, I form and dress these grooves by causing the rolls to revolve very slowly, while I introduce between them a revolving conical or taper drill, the shape and dimensions of the drill being answerable to the intended shape and dimensions of the groove to be cut. The drill has an end motion proportional to the motion of the rolls, so as to bring the proper parts of the drill in contact with the respective parts of the rolls."

[Printed, 4d. No Drawings.]

A.D. 1854, February 27.—N<sup>o</sup> 472.

STIRLING, JOHN DAVIE MORRIES.—This invention relates to the manufacture of tubes and cylinders of steel, which by drawing, hammering, or rolling, are worked out of cast cylindrical ingots. After the ingots are cast, they are by preference allowed to cool, and then when reheated they are subjected to a tilting or hammering process, previous to being drawn through a die or draw-plate, or extended by passing them on a fixed mandril between rollers appropriately grooved; this process is repeated until the tube attains the desired length and diametral size, it being reheated as often as necessary. Sometimes as soon as cast, the ingots are taken in the moulds and placed in an annealing oven. In place of fixed mandrils, tapering mandrils may be employed, such as are used in the drawing out or extending and reducing brass and copper tubes; the holes in the draw-plate graduate in size, and the tube is passed through them in succession, and when the finished size is attained, the tube is immediately drawn off the mandril, before the metal has had time to cool. The tubes may the for last drawing, if carefully annealed, be passed through the last hole in a cold state, which makes the grain of the metal close and compact.

[Printed, 4d. No Drawings.]

A.D. 1854, March 9.—N<sup>o</sup> 563.

SELBY, GEORGE THOMAS.—This invention relates to the construction of machines adapted to the manufacture of metallic tubes made from cast tubular ingots or short cylinders of copper

spelter, brass, lead, or other metal. These machines operate on the tubular casting by means of three short rollers of peculiar tapering form, trigonally disposed in horizontal position; their axes relatively parallel, find bearings in suitable side frames, one roller being intermediately beneath the other two, the necessary means being provided for advancing and retreating the rollers to and from each other, so as to increase or diminish the triangular central opening which they collectively form between them. Through this opening the tubular ingot, heated or otherwise, and placed upon a suitable mandril, is forced in the direction of the axes of the rollers at a regulated speed by an apparatus in front. The peripheries of the rollers, which are caused to revolve uniformly by tooth wheels on their axes, impinge upon the cast ingot as it revolves, and by degrees the latter is elongated and correspondingly reduced in diameter, the process being repeated until the desired size is attained, the tube to be reheated when necessary. To facilitate the effect of the rolling operation, before heating the tube it is dipped in a pasty solution of marl or other suitable earthy substance that will give way when pressure is afterwards applied, and when ingots are rolled out or extended in a cold state, their surfaces internally and externally are coated with oil or other unctuous matter.

[Printed, 1s. 4d. Drawings.]

A.D. 1854, March 9.—N<sup>o</sup> 565.

JOHNSON, WILLIAM BRACKETT.—The object of this invention, relating to the tubes employed in the construction of steam boilers and for other purposes, is to increase their thickness at the ends, in order that such tubes may be more securely fixed in the tube plates of boilers, or in other apparatus to which their use may be applied. The thickening effect is produced on the metal at the tube ends by end pressure whilst the metal is in a heated state and held by means of a short split mandril placed inside, and a pair of recessed dies which embrace and close upon the tube end externally, the result being a jumping up of the metal of the end of the tube, until the enlarged or recessed mouth of the dies is filled, and this end pressure may be effected whilst the tube end is held between the mandril and the dies by (it is stated) various *mechanical* arrangements.

The arrangement which is described and used for the purpose, consists of a machine or apparatus wherein the pair of dies are mounted, one, the lower die, being fixed, and the other is attached to and carried by the lower end of a vertical slide, which obtains up-and-down motion from an eccentric, is movable and capable in conjunction with its companion die, of gripping the end of the tube, which whilst so held is operated upon by a punch that, being set in motion by a crank through a connecting rod, acts direct upon the tube end, so as to compress and drive back the heated metal, and cause it to fill the recess or enlargement round the front end of the dies, the bore of the tube being supported by the mandril remains unaltered in size. Instead of actuating the compressing punch mechanically, the inventor contemplates the use for the purpose of effecting the jumping up of the ends of tubes, the direct expansive action of steam.

[Printed, 10d. Drawing.]

A.D. 1854, March 23.—N° 688.

NEWMAN, JAMES.—This invention relates to the manufacture of seamless metallic tubes, requiring neither welding nor brazing. Iron tubes are made from what is termed a billet, which is described as a short thick tube or hollow cylinder of wrought iron, made out of a skelp or narrow plate of suitable thickness, turned and worked into a tubular form by any of the well-known methods, and welded along the seam. The billet is cut into a number of lengths or small billets, each of which is intended when reduced and drawn out, to form a tube, which process is effected in the following manner:—Just inside one end of a small billet, a rod is inserted and driven, and it may be fixed or welded in; the billet is then through the other end filled with sand, silica, or earthy matter, which is rammed in as solid as possible, and then the billet is closed by driving in the end an iron plug, which may also be made fast by welding. The billet is then placed in a furnace, and when at a suitable heat it is taken out and passed between grooved rollers, which act upon it as revolving dies, and draw and lengthen it out to a rod or bar of any desired length, its diameter becoming proportionately reduced. When cold, if the rod has been filled with sand, the interior will consist of a vitreous substance, and if filled with earthy or other infusible

matter, it may be drilled or worked out, leaving the metal which formed the small billet lengthened out into the form of a tube.

Copper and brass tubes are made from billets prepared in the same manner, and annealed from time to time, the operation of drawing being performed upon the metal in a cold state, or when of copper, heated if preferred; and tubes of Muntz's metal are produced from cast ingots and bored billets, which are rolled or drawn out to the form of tubes.

[Printed, 4d. No Drawings.]

A.D. 1854, April 10.—N° 839.

**BOLTON, ALFRED SOHIER, and BOLTON, FRANCIS SEDDON.**—This invention relates to the manufacture of twisted or spirally fluted tubes. The draw-plate or die through which the tube is drawn has an internal configuration, similar to the form which it is intended the tube shall assume externally, and this plate or die is fixed in the centre or axis of a toothed wheel, which is mounted in suitable bearings at one end of the draw-bench, and is engaged by another tooth wheel, by which it is caused to revolve. The reduced end of the tube to be operated upon is passed through the die and gripped by the pliers attached to the draw-chain, which, when the machine is set in motion, drags the tube through the revolving die; the passage through the die imparts to the tube the desired form and twists it at the same time, any tendency which the tube may have to revolve being checked by a rod, which is attached horizontally to the pliers, and is carried along the bench in a transverse position.

[Printed, 6d. Drawing.]

A.D. 1854, April 20.—N° 908.

**RICHARDSON, ROBERT.**—This invention relates to jointing or connecting and securing the ends of pipes, by casting on the adjoining ends when laid in position a cast-iron coupling, for which purpose an annular mould is employed. This mould encircles the pipe so as completely to cover the ends which are to be united, forming an inclosed cavity around them; whilst in this position the melted iron is poured into the mould and filling the cavity, it takes the form of an annular strap or band. *Borax, tin, or zinc* may be employed to facilitate the union of the



molten metal with the iron of the pipes, or the pipe ends may be cleaned with a file or an acid. The moulds employed are made in two half parts, which are hinged together at the under side and secured by a link above, where there is a gate for pouring in the metal, and a vent-hole for the emission of air.

Describes and exhibits various examples of this mode of connecting pipes of different kinds laid both in and out of a direct line, and also an expansible core bar, which is to be used when the melted metal is admitted between the ends of the pipes, which are formed in various ways, generally as regards plain pipes, with an external bead round each extremity.

[Printed, 8d. Drawing.]

A.D. 1854, May 10.—N<sup>o</sup> 1044.

ANTHONY, JOHN, and CHAFE, WILLIAM TREBY.—This invention relates to the manufacture of pipes from lead and other soft metals or alloys.

Instead of, in accordance with the usual custom, employing only one die or mouth-piece and core-bar, and consequently producing only one pipe at a time; the inventors say:—"Our invention consists in combining two or more dies or mouth-pieces, either separately or in the same plate, with core-bars to fit in each; the dies or mouth-pieces to receive their supply of metal from the same retaining cylinder or metal reservoir, and to be placed at the bottom or top of the retaining cylinder or metal reservoir, as at present used, or at the sides, or any other part of the same. By this arrangement we are enabled to produce several pipes or tubes simultaneously in the same machine, and with the expenditure of no greater power than is employed for producing a single pipe or tube."

[Printed, 8d. Drawing.]

A.D. 1854, May 11.—N<sup>o</sup> 1047.

MILES, EZRA.—(*Provisional protection only.*)—This is an invention of a coupling joint for connecting pipes and tubes employed for conveying water, gas, air, or steam, and it may be employed for other connecting purposes.

"It consists of a hollow metal cylinder, the internal diameter of which is contracted at a short distance from the mouth,

“ similar to the ordinary socket pipe. Near the end of the pipe  
 “ which is to be connected with the cylinder is cast a boss or  
 “ shoulder, which is turned to fit the coupling cylinder, and the  
 “ outer portion or end of the pipe beyond the shoulder is made of  
 “ a conical form, terminating in a collar or flange; this part of the  
 “ pipe enters the contracted portion of the cylinder. Upon the  
 “ conical end of the pipe is placed a thick ring of vulcanized  
 “ india-rubber, somewhat larger than the diameter of the smaller  
 “ part of the cylinder. A hole is made through the socket of the  
 “ cylinder, and through a solid part left in the shoulder of the pipe  
 “ for that purpose, in which is fitted a pin. When the end of the  
 “ pipe is pushed into the cylinder, the elastic ring is forced towards  
 “ the base of the cone, and tightly compressed against the sides  
 “ of the coupling cylinder; the pin is passed through the cylinder  
 “ and pipe, which holds the two firmly together. As the internal  
 “ pressure on the joint is increased, it forces the elastic ring back  
 “ on the enlarged portion of the cone, rendering the joint tighter  
 “ as the pressure is augmented.”

Other plans for joining or connecting tubes are also proposed.

[Printed, 4d. No Drawings.]

A.D. 1854, May 22.—N<sup>o</sup> 1129.

CROSSLAND, ROBERT, HOLIDAY, WILLIAM, and HEATON, JOHN.—This invention relating to apparatus employed in manufacturing cast metal pipes and tubes, refers :—

1st. “ To combining a number of moulding boxes . . . upon  
 “ a rotating or other traversing carriage or frame, in such manner  
 “ that the successive operation of “ ramming up,” applying the  
 “ core,” “ casting,” and “ taking out ” the tube or pipe as cast,  
 “ may be simultaneously performed with different moulding  
 “ boxes of the series, as in their traverse they come up to the  
 “ positions appropriated to these separate operations. Also, to  
 “ forming each of such moulding boxes capable of opening in the  
 “ direction of its length, to free the pipe or tube when cast, and  
 “ thus facilitate its removal, and with the core seat at the bottom  
 “ thereof turning on a hinge joint, but capable of being held in  
 “ position by pin or other suitable fastening, which when released  
 “ allows the sand to escape and frees the casting.” When dry  
 sand is employed for moulding, the boxes when prepared, are

during their traverse subjected to heat before they arrive at the point where the casting is effected.

2nd. "Arranging a pair of endless chains (passing over suitable guide wheels) with carriages to receive the ends of core bars, and conduct the cores formed thereon into and from a drying oven or chamber; the openings to and from which are so arranged, that whilst a core is being admitted to be dried, a dried core is also allowed to pass out therefrom, the opening or openings being only of sufficient size to admit of the transit of the cores and their carriages."

[Printed, 2s. 6d. Drawings.]

A.D. 1854, May 30.—N° 1197.

SCOTT, MICHAEL.—This invention comprises two methods of forming the ends of pipes which are to be joined or connected together, consisting in:—

1st. A flanged joint, which is expected to yield when any longitudinal expansion or contraction of the pipes occurs. This result is accomplished by making the diameter of the flange very much beyond the usual size in relation to the size of the pipe, in order that it may possess in a radial direction, a certain amount of flexibility, a suitable packing being interposed between the meeting surfaces, which are as close as possible to the verge or margin. The flanges may be either cast or made of wrought metal, and fitted to fix on the ends of the pipes.

2nd. A socket joint or connection. The socket is formed to receive a packing ring in a shallow annular curved groove at its bottom, and the spigot end of the other pipe is also recessed to correspond; the packing or joint ring may be modified in cross sectional form, and be made of gutta percha, lead, tin, or other suitable material, tubular or otherwise. The pipes are held in position by a series of wedges, which are driven in at close intervals all round into the socket, between it and the spigot end of the adjoining pipe. This joint is also intended to possess a certain amount of flexibility.

[Printed, 8d. Drawing.]

A.D. 1854, June 20.—N° 1343.

REEVES, CHARLES, and WELLS, WILLIAM.—This invention relates to the manufacture of tubes of various shape in transverse

section, comprising round, fluted, or polygonal, such tubes being made of varying diameter, or tapering from end to end. The apparatus employed consists of a circumposed series of segmental pressing dies, so disposed at intervals round a common center, that their curved peripheries collectively form there a hole or aperture. These dies are all mounted on axes eccentric to their curved peripheries and arranged in a suitable frame, and when the tube or article to be operated upon is introduced on a mandril between them, they are caused to move by a powerful spring on their axes at a uniform speed and impinge upon the surface of the tube, the axes being geared together by toothed sectors.

[Printed, 10d. Drawings.]

A.D. 1854, July 7.—N° 1493.

LACY, WILLIAM.—This invention relates to the making of copper rollers, cylinders, and tubes from old rollers, and also by casting them.

1st. Two old cylindrical rollers which have been in use for printing or other purposes, are turned externally in order to remove the engraved or other surface, and the nib or feather formed internally to fit in the groove or recess of the mandril, is removed from either one or both. One of the two rollers is then heated and expanded by passing a draw burr through it or otherwise, and when it is sufficiently enlarged, the other roller is slid or driven into it, and becomes securely fixed by the contraction of the metal, as the outer roller cools. The compound roller is then finished, and is thereby made ready for use as a new roller.

2nd. Casting rollers and hollow cylinders of copper in cast-iron moulds, such rollers or cylinders to be afterwards used as copper rollers or for the manufacture of tubes. The moulds are so constructed, that the molten metal flows down vertical ducts or passages at opposite sides, and entering the mould at the bottom, gradually rises to the top without disturbance from air bubbles, and consequently the casting finishes with a surface more free from faults.

[Printed, 6d. Drawing.]

A.D. 1854, July 28.—N° 1667.

PETIT, AMABLE HIPPOLYTE.—This is an invention of a mode of *jointing pipes*. Upon the ends of each pipe are formed

double lugs at opposite sides or at three trigonal points, and they are pin jointed or hinged to the ends of other pipes by means of links or claws, a washer being interposed and compressed between the ends or meeting surfaces of the pipes when they are drawn together. The washers are by preference made of vulcanized or alkaline caoutchouc, but other substances, such as gutta percha, leather, wood, lead, tow, &c. may be employed for the purpose.

[Printed, 8d. Drawings.]

A.D. 1854, July 29.—N° 1672.

BURKE, EDMUND, and STOCKER, ALEXANDER SOUTHWOOD.—This invention relates to the manufacture of tubes or hollow articles by coiling or overlapping twice or thrice round a mandril a thin sheet or sheets of metal, the several layers to be afterwards “massed, consolidated, or soldered together.”

The mandril employed must be of corresponding size to the intended bore of the tube; it must have a groove, or be furnished with other means to hold the end of the sheet while it is being coiled or lapped on, and be otherwise made suitable for the purpose, and capable of withdrawal after the overlapping coils have been secured by hoops or collars, or bound round with wire, and it must revolve whilst the sheet is being wound on, appliances being at hand for pressing or causing the several laps to lay close, one over the other, in intimate contact. After the ends of the coiled tube are squared off and the mandril withdrawn, the tube is galvanized or immersed in a bath of molten zinc. In some cases the sheets of metal, previous to being wound on the mandril, have their surfaces prepared in a manner to promote the ready adhesion of the coating metal, and secure a perfect union of the several layers or coils.

Tubes which are subjected to great internal pressure are to be hooped or strengthened by bands; screw threads on the ends of tubes are not cut into the metal, but either struck up by “dead pressure” or formed on ferrules, which are shrunk on the ends of the pipes and galvanized.

[Printed, 10d. Drawing.]

A.D. 1854, August 1.—N° 1693.

MCGAFFIN, JOHN.—This invention relates to the manufacture of metallic pipes from corrugated metal sheets, by preference iron



galvanized or coated with zinc. The corrugated sheet metal is bent into a cylindric form of the diameter and size required, and the edges which lap are secured either by rivetting or by screws and nuts or otherwise, the corrugations running round at right angles or transverse to the axis. The corrugated sheets (when a long cylinder or length of pipe is required) may be rivetted or fastened together, either before or after they have been bent into the cylindric form. The mode of bending is not described.

[Printed, *6d.* Drawing.]

A.D. 1854, August 21.—N<sup>o</sup> 1835.

SMITH, WILLIAM HENRY, BESSEMER, HENRY, and LONGSDON, ROBERT.—This invention relates “chiefly to the “ manufacture and treatment of the vitrified substances or ‘slags,’ “ produced in the smelting of iron and other metals,” such products after undergoing a refining and coloring process, being cast or pressed in moulds into a variety of forms and articles, comprising table tops, mantel pieces, tiles or slabs, statuary, columns, pavements, blocks, and pipes.

The slag in a fluid state flows from the smelting furnace along heated troughs or pipes of fire-clay into fire-clay pots or vessels, which are circularly arranged in a furnace after the manner described by H. Bessemer, in the Specification of his Patent relating to the manufacture of glass, and bearing date March 22, 1848, No. 12,101 the pots being heated by a central fire. The slag remains in the pots until the gaseous matters have escaped, the heavy impurities have subsided, and the lighter matter floated to the surface.

The color of the slag is altered by means of metallic oxides, put into the pots or vessels in a powdered state and briskly stirred, and by adding an alkaline salt the amalgamation is hastened.

It is made to assume the appearance of stone by throwing in sand, lime, burnt clay, and other substances in a heated state.

Thin or ornamental castings are produced from it when in a fluid condition, and necessarily at a high temperature, and at a lower temperature in a plastic state, it may be rolled, blown, or pressed into moulds made according to the nature of the work, either of “ sand, loam, plaister of Paris, and stone, and in moulds “ formed partly of sand and partly of iron, in an apparatus for “ forming ornamental designs in sand, and also in moulding or “ *rolling small tessalæ or other article by revolving moulds.*”

"For hollow articles such as drain pipes, columns, &c., having  
"a plain circular or polygonal section, we construct a metal  
"mould, truly bored or planed, and of a slightly conical form, of  
"which shape the core is also to partake. The mould thus  
"composed is fitted to a suitable frame, so arranged that the core  
"may be counterbalanced, and made to slide out quickly im-  
"mediately that the tube or other article is sufficiently hardened.  
"A sliding pusher or lever is also to form part of this moulding  
"apparatus, and is for the purpose of forcing out the pipe or other  
"article when formed; but in some cases we find it preferable to  
"make the exterior portion of the mould sufficiently large to  
"admit of a lining of sand, against which the fluid slag is cast,  
"and in which the pipe or column cast may be removed to the  
"annealing oven; this plan affords greater safety and facility for  
"moving or packing in the oven."

[Printed, 3s. 2d. Drawings.]

A.D. 1854, August 26.—N<sup>o</sup> 1873.

SMITH, WILLIAM and PHILLIPS, THOMAS.—This invention relates to a mode and preparation for connecting the ends of cast iron pipes and tubes suitable for the conveyance of water, gas, or steam. The two ends of each pipe are shaped or formed alike, each having a V-shaped annular groove or recess near the extremity, which is reduced and chamfered off, so that when the ends of two pipes in a right line are placed together, an intermediate groove is formed by the ends, for the reception of a suitable packing of lead, cement, hemp, or other substance, previous to placing over the junction a collar or strap coupling, which is made in two halves, with projecting ears that are drawn together by small screw bolts and nuts, each edge of the collar having internally a V-shaped projection to fit into the V-shaped annular groove formed round the ends of the pipes, which have the effect when the two halves of the collar are tightened round the pipes, of drawing them together. If the ends of the pipes and the annular grooves, instead of being formed at a right angle to the axis of the pipes are respectively made more or less at an incline thereto, the pipes may be laid deviating from a direct line, so as to form curves, thereby obviating the necessity for casting pipes with bends.

[Printed, 10d. Drawings.]

A.D. 1854, August 29.—N° 1893.

**WILLIAMS, JOHN FISHER.**—This invention has for its object when forming the junction of or connecting together cast iron pipes, the employment of "asphalted felt" or other flexible compound of either animal or vegetable fibres, saturated with any kind of bituminous, gummy, or resinous substances. The ends of the pipes are cast to form what are termed spigot and faucet, or socket joints, that is, the fore end of each pipe in succession enters into the after end of that which precedes it. The sockets have a recess formed at the bottom, into which the asphalted felt or other saturated packing is compressed by the end of the adjoining pipe, which is suitably formed for the purpose. The ends of the two pipes being thus placed one within the other, are drawn together by screw bolts, or other appliances passing through projecting coupling lugs, which are cast upon the ends of the two pipes; as an additional security the felt or other packing may be used to caulk the joint.

[Printed, 6d. Drawing.]

A.D. 1854, September 4.—N° 1934.

**SKIDMORE, FRANCIS ALFRED, and BOLTON, JOSEPH.**—(*Provisional protection only.*)—This invention, relating to a mode of jointing or connecting together the ends of cast-iron pipes to form continuous lengths, is designed as an improvement on the system of spigot and faucet connections, such as are completed by caulking or soldering. For this purpose the pipes are cast with screw threads on their ends, respectively on the plain end externally, and with corresponding threads inside the socket or faucet, which is formed at the other extremity, so that they are connected by screwing the plain end of one pipe into the socket end of the other, a washer of gutta percha or other suitable material being introduced in the socket, to bed between the bottom of the socket and the other pipe end when the latter is screwed home.

[Printed, 4d. No Drawings.]

A.D. 1854, October 2.—N° 2109.

**SHERRIFF, THOMAS.**—This invention relates to the construction of the moulds of sand or loam employed in casting metallic pipes and other cylindrical articles. These moulds are formed "gradu-

ally from the bottom upwards by means of two or more rollers or pulleys, which are made to run round, and press or roll down the sand or loam in continuous thin layers; these rollers being carried by a lantern or frame, which is made to rotate by a central shaft upon which it rises as the mould is being formed. The inner cylindrical surface of the mould is shaped by a short cylindrical pattern (its upper surface being conical,) which rises with the lantern and rollers as the mould is being formed. It is preferred to employ conical rollers and to set them on inclined spindles, so that the lowest parts of their peripheries may be horizontal, or they may be so set as to give them a slight inclination below, with a view of pressing the sand or loam slightly inwards or outwards, as may be desirable. The central shaft revolves in fixed bearings, and the lantern or roller frame is fitted upon it with a groove and feather; or the shaft may be squared, the boss of the frame being made with a square eye to correspond, so that the lantern can rise upon the shaft, notwithstanding that it is turned by it. The rollers are covered by a disc, formed with channels or openings, to admit the sand down in front of the rollers, the sand being supplied from above. A tube is fixed to the top of the disc, so as to envelope the central driving shaft, and prevent the sand from getting into the eye of the lantern boss, and segmental shields are provided to keep the sand off the top of the pattern and to guide it under the rollers. In case any sand gets upon the top of the pattern, notwithstanding the presence of the shields, it will fall through openings provided for that purpose." Screw blades, turning with and rising upon the central shaft, may be substituted for the pulleys and rollers, and by slightly modifying the apparatus, it may be adapted to the moulding of articles of other form.

[Printed, 8d. Drawing.]

A.D. 1854, October 19.—N° 2234.

WINFIELD, ROBERT WALTER.—This invention relating to the manufacture of or mode of treating tubes and tubular articles and rods adapted to the construction of metallic furniture is described as follows :—

"I coat or cover the said rods and tubes with zinc, tin, copper, or other metal or alloy, and afterwards pass the said tubes and rods through a draw plate, such as is used for drawing metallic



“ tubes; or I pass the said coated rods and tubes through a collar  
“ of any suitable metal or material, the metal or material of which  
“ the said draw plate or collar is composed being varied to suit  
“ the metal or alloy with which the rods and tubes are coated; a  
“ hard draw plate or collar being used with a hard metal or alloy  
“ on the coated rods and tubes, and a soft draw plate or collar  
“ being used with a soft metal or alloy on the coated rods and  
“ tubes; the said draw plates and collars being made, by prefer-  
“ ence, and where practicable, of a material harder than the metal  
“ or alloy on the rod or tube to be drawn through the said draw  
“ plates and collars.”

The above process imparts a smooth surface to the rods and tubes, which may be improved by polishing with rotten stone or by other methods. The coating of the rods and tubes with either of the above-named metals or alloys is to be effected by any of the well-known processes.

[Printed, 4*d*. No Drawings.]

A.D. 1854, October 25.—N<sup>o</sup> 2271.

STOCKER, ALEXANDER SOUTHWOOD.—(*Provisional protection only.*)—This invention relates to the manufacture of tubes applicable to gas and other purposes, and to the machinery and appliances employed. These tubes are made of great strength from sheet metal, by inserting one tube within another two or three fold, and submitting the tubes thus combined to a bath of soldering or other material, which fills the interstices between them and forms one solid tube, the strength of which may still further be increased by closely coiling wire externally upon it throughout its whole length before it is galvanized or soldered, the extreme ends being left plain for screwing.

Another mode of making sheet metal tubes consists in laying over the longitudinal joint or seam a narrow strip of metal, and then after closely binding or coiling wire upon the tube from end to end, submitting it to the galvanizing or soldering bath.

In some cases the longitudinal strip may be dispensed with.

The tubes are formed by drawing the sheet of metal, which is cut to the required width, through dies upon a mandril after the metal has been bent by a half circling tool or apparatus, and the sides closed upon the mandril by a pair of rollers which move along, one at each side respectively pressing down and closing the



seam. The wire is then coiled on the tube by a machine similar in construction to a slide lathe, the tube revolving whilst the wire is carried along and delivered at the speed necessary for laying on the coils.

The mode of making the connecting screws by means of dies in a press is also described.

[Printed, 4*l*. No Drawings.]

A.D. 1854, November 6.—N<sup>o</sup> 2346.

CHILDS, WILLIAM, the younger.—This invention, relating to the manufacture of pipes and tubes from strips or ribbons of sheet metal with chamfered edges, consists in winding such strips when heated to a welding heat, spirally round a cylinder or mandril-roller, the edges of the strip being welded as quickly as they come together. The process is performed by means of an apparatus consisting of two rollers horizontally mounted in suitable side frames, one over the other; these rollers are capable by means of set screws of being raised or lowered, and separated to form an intermediate space for taking in between them the mandril roller, whereon the heated strip of metal is spirally wound, the chamfered edges lapping one over the other, are welded by the pressure of the two rollers as the operation proceeds. The newly formed tube is caused gradually to slide off the end of the mandril roller by the friction of a pair of drawing bowls, and by this means welded tubes of uniform diameter and any desired length may be made continuously, but when taper tubes are required the mandril roller must be shaped tapering to the desired form, and its length determines the length of tube that can be produced.

[Printed, 10*l*. Drawing.]

A.D. 1854, November 6.—N<sup>o</sup> 2347.

FARJON, LOUIS ALEXANDRE.—(*Provisional protection only*).—This inventor states in respect to his invention of a "system of jointing pipes, tubes, and conduits in general" as follows:—"My method of jointing dispenses entirely with screws in the joining together of the ends of pipes, and is effected by means of a clip, which takes into a rim or collar on one pipe, and into an inclined ring on the end of the other pipe which is to be joined to it, an india-rubber or other like suitably elastic washer

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“ being interposed between the two pipes. This elastic washer  
“ fits into a channel in the end of one pipe, while a projection  
“ from the end of the opposite pipe abuts against it. The tight-  
“ ening of the joint is effected by turning the clip towards the  
“ inclination in the inclined ring, while the pipes may be detached  
“ by turning the clip the reverse way. The clip fixes on to  
“ and is detachable from the collar and inclined ring by a bayo-  
“ net fastening. Should the pipe itself not admit of a rim or  
“ collar being cast on or forming body with it, then I fix a  
“ supplementary joint piece into the end thereof, having the  
“ necessary rim or collar thereon.”

[Printed, 4d. No Drawings.]

A.D. 1854, November 8.—N° 2370.

CHAMEROY, EDMÉ AUGUSTIN.—This invention, relating to a peculiar mode of making sheet metal pipes, and to the manner of connecting or jointing them together, consists in covering “such  
“ pipes with a coil or lapping of paper, soaked in bitumen or  
“ other similar material. The junctions of such pipes are formed  
“ by frictional contact alone, without screws or screwing of any  
“ kind. It is proposed to employ soft metal, such as lead, zinc,  
“ or tin, either alone or combined with each other, for the junc-  
“ tion surfaces, such metal being fused on to the ends of the  
“ pipes in the form of rings placed externally and internally, so  
“ as to fit into each other. They are made slightly conical for  
“ that purpose, and may be grooved to receive a packing of any  
“ suitable material. This grooving may be effected by the aid of  
“ a suitable instrument fitted with a scraper of the size and form  
“ of groove required. A cast iron or other hard metal mould of  
“ a suitable form, according to the form and size of junction ring  
“ to be attached, is employed for fusing such rings on to the ends  
“ of the pipes, the soft metal being poured round the pipe, which  
“ is placed with one end in the moulds. In some cases card  
“ board, or gutta percha and caoutchouc of a proper consisteney,  
“ may be employed in place of soft metal. The form of the joints  
“ may be varied, so that the parts to be joined may look into each  
“ other. For this purpose a groove or annular recess may be  
“ formed on one junction piece, and a corresponding projection  
“ on the other, to fit into such groove; or one surface may be  
“ *corrugated*, and the outer friction piece closed into it, by the

"aid of an instrument fitted with rollers with peripheries of a  
 "corresponding form to the corrugations. A layer of gutta  
 "percha or leather may be interposed between the junction sur-  
 "faces in some cases for the purpose of rendering them still more  
 "impervious to vapours or fluids."

[Printed, 10d. Drawing.]

A.D. 1854, November 14.—N<sup>o</sup> 2412.

PEARSON, SAMUEL.—This invention relates to the manufacture of twisted barrels, pipes, and tubes, which instead of being formed by winding a single strip of metal spirally round a mandril, severally consist of two V-shaped strips or pieces which are spirally wound on the mandril, the base of one strip being wound in contact therewith forms an intermediate V-shaped space, which is filled up by the other V-shaped strip being inserted therein and wound on; after being rolled and welded in the manner usually practised or otherwise, a perfectly tight and solid pipe or barrel is produced, it is stated, superior to the pipes or barrels made when only a single strip is wound on the mandril and butt or scarf-jointed at the edges. Instead of single V-strips, strips with double V's (thus W in tranverse section) may be used.

[Printed, 6d. Drawing.]

A.D. 1854, November 24.—N<sup>o</sup> 2488.

STIRLING, JOHN DAVIE MORRIES.—This invention relates to the manufacture of metallic tubes, which are formed by extending or drawing out tubular ingots by means of rollers, which gradually act upon and strip the ingot whilst in a heated state from the end of a stationary mandril. The tubular ingot is cast of copper, copper alloys, or other suitable metal, and arranged to contain a sufficient body of the metal to produce a tube of the external diameter and length required, and it is exposed previous to the rolling process, to such a degree of heat in a reverberatory furnace or muffle as the nature of the metal will permit or require.

The rollers are employed in pairs circumferentially grooved to correspond and suit the desired size of the tube. The mandril employed is fixed and stationary its end supporting the heated ingot, which is gradually drawn or stripped off by the grip of the

rolls. The tube thus made in its first rough state may be received at the back of the rollers on another mandril, and it is finished by passing through other grooves diminishing in size until a tube of the desired dimensions is obtained, the metal during the process, to be re-heated from time to time, in order to maintain the degree of heat necessary to ensure the success of the operation.

[Printed, 4d. No Drawings.]

A.D. 1854, November 30.—N° 2522.

MURRAY, CHARLES. — (*Provisional protection only.*) — This invention relating to the manufacture of metallic tubes and hollow cylinders, “consists of a peculiar mode of forming  
“ordnance, barrels of fire-arms, and hollow cylinders of wrought  
“iron, when using successive layers of iron one over the other  
“in order to get greater strength. For this purpose the iron is  
“first rolled into slabs tapering towards the edges, the tapering  
“being from the middle of each slab outwards towards both  
“sides or edges, so that when a slab is bent into a tubular form  
“the bore will be excentric, and where the weld is made the  
“metal will be comparatively thin, whilst the metal at the  
“opposite side of the cylinder will be comparatively thick. Over  
“this first cylinder a second one made similarly is placed and  
“welded, the thicker part of the second cylinder coming  
“opposite the thinner metal of the first cylinder, and so on for  
“any number of layers of iron, and in order that the grain of  
“the succeeding layers of iron may cross each other, the portion  
“which is intended to be used for producing a layer in the  
“making of a piece of ordnance, barrel, or a cylinder, is cut  
“from a larger slab in such manner that the ends incline to the  
“direction of the grain, and so that when layer on layer are  
“used, the grain of the several layers will be oblique to the axis  
“of the piece of ordnance, barrel, or cylinder, and the grain of  
“each layer will cross the grain of the next layer, by which  
“means great strength will be obtained.”

[Printed, 4d. No Drawings.]

A.D. 1854, December 5.—N° 2553.

COOPER, THOMAS.—This invention relates to the construction  
of pipes, and to the mode of connecting or jointing them together



to form a continuous length. These pipes are made plain at both ends, without either flanges or sockets, but close to each end externally they are formed with one or more annular grooves, which are severally either to be filled with a suitable cement, or with an elastic band or packing made of some elastic material. The pipes placed respectively end to end, are connected by means of a coupling in two halves, which when applied over the junction of the pipes, are united or drawn together by means of inclining dovetails, one part sliding on the other, thus both are made closely to embrace the pipe when driven home, and by means of either the interposed cement or other material which fills and stands out of the groove above the surface of the pipe, it is stated that a sound joint is obtained.

A modification is described, whereby the halves of the tubular coupling are made to close over the junction of the pipes by means of two cotters, one on each side.

[Printed, *6d.* Drawing.]

A.D. 1854, December 7.—N° 2571.

MCCONNELL, JAMES EDWARD.—This invention relates to heating feed water by means of exhaust steam; forging a steam engine piston and piston rod in one piece, and adapting the metallic packings thereto without a covering plate; also for constructing flue tubes for locomotive boilers. The first parts of the invention will be found described in the series of Abridgments relating to the "Steam Engine," and as regards locomotive tubes they are according to the last part of the invention severally made of two sizes of tube, one half of the length of each tube being larger in diameter than the other half, which is slid a sufficient distance into the former to make an annular lap joint, and when the combined tube is disposed in the boiler, the ends of the larger section of each of the tubes are set into the tube plate of the fire-box, and the other or smaller ends into the tube plate of the smoke box, so that when the boiler is at work, the hot draught from the fire-box will be partially checked in the tubes at about the midlength, where the internal area suddenly diminishes, and it is stated the hot draught will afterwards "act more strongly upon the smaller area towards the smoke-box."

[Printed, *1s. 4d.* Drawings.]

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1855.

A.D. 1855, January 12.—N° 84.

**MILES, EZRA.**—This invention of a coupling for jointing or connecting pipes and tubing, and for other purposes, relates to the employment and introduction of a kind of rolling packing, in the construction of socket joints, junctions and unions.

The coupling consists of two primary parts, viz., a tubular socket piece and a tubular plug; that part of the plug which enters the socket is made conical, with a shallow bead round its lower end. The packing is a ring of vulcanized india-rubber, which is slipped over the bead on the small end of the conical part of the plug, and when the latter is introduced into the socket piece, the ring (the material of which is circular in cross section) rolls transversely up the cone, and becomes gradually compressed between the cone and the socket, and thus forms a fluid-tight connection, the efficiency of which any internal pressure is likely to increase; when the plug is forced home, the two parts are secured by a cross pin.

“ In any case where a tube terminates with the female portion of my joint, and is required to be closed to prevent the escape of air, steam, gas, or any liquid, I insert into the female portion a conical plug resembling the male portion of the joint, with a ring of the same description that is used for the said joint; I also employ the same means of fastening this plug as is employed to fasten the male portion of the joint. This method I employ also for the insertion of plugs under all ordinary circumstances when a tube requires plugging. Should my moveable or rolling packing be used in suction pipes, I propose that the female part should be made conical internally, the widest portion being near the entrance, the male portion in this case must be parallel. I also wish it to be understood that, if found requisite, I propose to introduce a valve or cock in the female part of the joint, to close it when the male is absent.”

[Printed, 10d. Drawing.]

A.D. 1855, February 16.—N° 352.

**PATTINSON, HUGH LEE, junior.**—(*Provisional protection only.*)  
—This invention relates to the manufacture of wrought-iron tubes

without seams or welds, by forcing the metal in a highly heated state through dies or openings, to which are adapted fixed mandrils or stationary cores. A cylinder or receiver in which the dies are fitted is employed to contain a mass of the highly heated metal, which is to be forced out through the dies in a somewhat similar manner to that which is practised in the manufacture of pipes from lead or from plastic substances.

[Printed, 4d. No Drawing.]

A.D. 1855, March 13.—N° 563.

ILIFFE, CHARLES.—(*Provisional protection only.*)—This invention relating to the manufacture of metallic tubes, rods, and bars, is described by the inventor as follows:—"In making iron tubes  
" I cast a cylinder or billet, either in pig iron alone or in a mixture of pig iron and wrought iron scrap, which can be afterwards  
" rolled out to any desired length upon a mandril; and for bars  
" and rods I first make a cylinder or billet in wrought iron, and  
" then fill this billet with cast iron, and roll the whole out  
" together. For tubes or other metals which may be drawn or  
" rolled cold, I charge the billet with lead or other soft metal,  
" wax, fat, soot, or liquids to be afterwards melted out."

[Printed, 4d. No Drawings.]

A.D. 1855, March 20.—N° 630.

NEWTON, ALFRED VINCENT.—(*A communication.*)—The object of this invention is to facilitate by the aid of mechanical contrivances, the preparation of the sand moulds which are employed for casting pipes and other articles. "For this purpose the mould  
" box for receiving the sand is fitted with a hollow piston, which is  
" worked by means of cams, and carries the pattern to be moulded.  
" The pattern is fitted to the piston by an arrangement of parallel  
" levers, so that it may receive an independent motion, and retire  
" from the sand before the pressure is entirely removed therefrom.  
" When moulding pipes, for example, the pattern is suitably  
" shaped to form a half-round impress in the sand when in its  
" raised position. Hinged to the ends of the mould box are caps  
" which are thrown over the ends of the box for the purpose of  
" holding sand when the pipes are required to be cast with bell  
" and faucet ends. These are thrown back after the sand has  
" been wedged in under them, and a flask is then placed over

“ the mould box and secured thereto. The piston carrying the  
“ pattern is then caused to rise and press the sand upwards into  
“ the flask, thereby forming a half mould, the compression of  
“ which at the edge or ‘parting’ will be such as to ensure a good  
“ casting from the mould.

[Printed, 10*d*. Drawing.]

A.D. 1855, March 23.—N° 644.

BEHN, CHARLES FREDERICK.—(*A communication from David Brown.*)—The main object of this invention, which relates to mechanical contrivances for making moulds for casting metals, is to make such moulds at the partings of the flasks firm and hard, so that the edges may not break, and also to increase the facility and rapidity with which such moulds can be made.

The apparatus consists of an open rectangular box, having within it a piston which is capable of motion up and down. “The  
“ piston is arranged so as to receive the pattern, which it raises  
“ into the half flask together with the sand to form the mould,  
“ The piston and apparatus is formed to admit of the pattern  
“ descending into the piston before the piston itself descends.  
“ The piston, it is preferred, should be raised and lowered by  
“ eccentrics on an axis; but the means of raising and forcing  
“ the piston into the box may be varied. In making a mould  
“ two half-flasks are used, and only one-half of a mould is made  
“ at a time, and the making of a half mould is performed by  
“ placing sand in the box above the piston and the pattern.  
“ The quantity of sand is regulated by a frame and strike.  
“ After the sand has been thus placed in position, one of the  
“ half-flasks is fixed to the box, and the piston and pattern  
“ together with the sand are forced into the half-flask, by which  
“ the sand will be pressed into the form of the desired half-  
“ mould. The pattern is then allowed to descend into the piston,  
“ and then the piston is lowered into the box, leaving the half-  
“ mould in the half flask.”

[Printed, 8*d*. Drawing.]

A.D. 1855, March 24.—N° 651.

ELDER, DAVID, junior.—This is an invention of apparatus for moulding pipes and articles in mould boxes vertically disposed on wheel carriages or trucks, which are conducted on rails to

beneath the the cross beam of the apparatus, which comprises an annular rammer and a short cylinder with a coniform top, constituting the model or pattern, which is disposed inside at the bottom of the mould box, and is gradually caused to rise. The sand by any convenient means is fed into the top of the mould box, and falling upon the conical top of the pattern is equably distributed, and sliding downwards into the annular space between the pattern and the mould, is rammed in by the strokes of the annular rammer, to which an up-and-down motion is imparted by means of eccentrics on a revolving cross shaft carried by the cross beam. This cross beam of the apparatus gradually rises as the mould-box fills, and the pattern being drawn up by it, leaves the rammed-in sand, which forms a tolerably solid lining to the mould box. It is stated that the arrangements may be modified, by making the pattern piece also act as a rammer, and that other articles varying in transverse section, may also be moulded by the apparatus with as much facility as cylinders and pipes.

[Printed, 10d. Drawing.]

A.D. 1855, March 26.—N° 657.

DECHANET, JEAN BAPTISTE, and SISCO, ANTOINE DOMINIQUE. — (*Provisional protection only.*) — This invention relates to the manufacture of tubes or pipes of malleable metal, and to the apparatus employed. The inventors say, "Our process which is to be applied to the manufacture of tubes or pipes when a great resistance is necessary, consists in winding or rolling tightly round a mandril sheets of either iron, steel, or compounds of both these, or any other suitable metals, as many times as is necessary to produce tubes or pipes of the required size and thickness. The layers of these rolled sheets are then made to adhere together by soldering them, either with copper, gun metal, or brass, or any other available metal or alloy, according to the kind of metallic sheets which have been employed to make the said tubes or pipes. These tubes or pipes may in many instances be substituted for cylinders or rods of solid metal."

The machine comprises a mandrel turned by two crank handles, one at each end, and a guide for controlling the metallic sheet as it is wound thereon.

[Printed, 6d. Drawing.]



A.D. 1855, April 4.—N° 755.

MOUCHEL, LEWIS AMBROISE MICHEL.—(*A communication.*)—This invention relates to a mode of connecting pipes, tubes, and ducts, the abutting ends of which are “formed with flanges thereon, the flange on one of the said ends being at right angles to the pipe, and the flange on the other of the said ends being inclined thereto, or forming as it were, a single thread of a screw. A groove is formed in one of the abutting ends, into which is inserted a washer of india-rubber, or other suitable elastic material; and a projection is formed on the other of the abutting ends, which fits into the groove and against the elastic washer. A loose collar with two or more clip hooks is fitted over the two flanges by means of a bayonet joint, so that by turning the collar partly round, the clip hooks will be made to act against the inclined flange, and thus force the abutting ends of the pipes, tubes, &c. together, compressing the india-rubber or other flexible washer between them, and producing a tight joint. By turning the collar in the opposite direction, the pipes, tubes, &c. will be disunited. When it is not convenient to form the flanges on the ends of the pipes, tubes, &c. they may be formed on supplementary pieces, which can be fitted to the pipes, tubes, &c., in any convenient manner.”

A variety of these inclines are described and illustrated, consisting of:—A joint in which the movable collar is dispensed with; a joint wherein a caoutchouc washer is employed; a connection between two pipes made by means of spring catches, an india-rubber washer being interposed; a junction of pipes made by means of hooks instead of spring catches; joining two pipes by means of cottars and pins, also with screw pins; mode of connecting the feed pipe of a locomotive; couplings applied to taps or cocks for liquids; cocks for gas burners; joining stoppers to glass bottles and jars; and several modifications.

[Printed, 10d. Drawings.]

A.D. 1855, April 20.—N° 877.

PEARCE, JOHN CHARLES.—This invention, relating to a mode of connecting pipes, refers to the packing employed, which consists of thin sheet metal crimped or corrugated to give it flexibility. When employed for securing fluid-tight the junction of



flanged pipes, the corrugations take the form of a series of concentric rings, and when used in jointing socket pipes they are in the form of rings corrugated circumferentially, or bands longitudinally, an annular recess being formed round the plain end of one of the pipes to receive the packing and conduct it into the socket of the other pipe, when the two ends are brought together. The corrugations are to be filled with any suitable cement or other plastic or yielding substance, such as vulcanized india-rubber, gutta percha, &c.

The concentric corrugations on the flat packings or washers are made between suitable dies, and on the rings or bands they are produced by grooved rollers. The quality and thickness of the sheet metal out of which the packings are made will vary according to their particular adaptation, and the metal whereof they are made may be either iron, copper, tin, zinc, lead, either alone or alloyed. For some purposes the corrugated packings may be cast.

[Printed, 10d. Drawing.]

A.D. 1855, May 21.—N° 1132.

STOCKER, SAMUEL.—This invention relates to machinery or apparatus for shaping metallic articles; adapting fly presses to the production of inner joints for gas fittings and other purposes; means and apparatus for producing from short tubes various metallic articles; and cutting screw threads upon and in union joints and otherwise.

1st. The apparatus for shaping metallic articles has in appearance a close resemblance to a turning lathe, there being an iron bed mounted on standards and carrying two headstocks, but the mandril instead of revolving is moved longitudinally by a powerful screw which is turned by a fly wheel; various shaped tools and blocks are adapted to fit on the nose of the sliding mandril, and other tools of converse form are adapted to the other headstock, and by this means upon short lengths of tube are produced swells, rings, flanges, &c., and the tube ultimately by pressing and working is made to assume the desired form. Iron tube in a heated state is worked to any desired shape in the same manner.

2nd. Relates to the adaptation of the fly press for operating pieces of tube by means of suitable dies and mandrils for making union joints and similar articles.

3rd. Adapting the common fly-press to the making of tubular pillars for candlesticks and lamps and similar articles which, by means of top and bottom tools and appliances are annularly indented in some places and swelled in others, in accordance with the desired form.

4th. A simple apparatus for cutting screw threads in union joints and otherwise, by means of a mandril mounted on standards, and whilst revolving worked forward by a screw into gradual contact with the cutting tools.

[Printed, 8d. Drawing.]

A.D. 1855, May 26.—N<sup>o</sup> 1199.

HARRISON, CHARLES WEIGHTMAN.—This invention relates to two processes of manufacturing hollow or solid ropes, cables, and rods. It consists :—

1st. “ In forming ropes and cables, solid or hollow, of a number  
“ of angularly-shaped plates or strips placed together side by  
“ side upon a core and parallel therewith. Each of these strips  
“ in its transverse section forms a sector of a circle, the angles  
“ of two of its opposite sides being either radial lines from a  
“ centre or central core, or forming a tangent thereto. Around  
“ the strips so placed I lay, either spirally or otherwise, a coating  
“ of felt, or some other suitable fibrous material; and to pre-  
“ serve the metal strips from oxidation, I saturate such covering  
“ with tar, marine glue, or other compound of a similar nature.  
“ Upon this covered core I wind wire or flat metal ribbons, or  
“ rectangular metal strips, but I prefer for the most part to use  
“ one or two narrow flat ribbons or sheets for this purpose, so as  
“ to form spirals approaching to a right angle with the axis of  
“ the core, and thus avoid impairing the flexibility of the rope or  
“ cable.”

2nd. Making flexible ropes by coiling two bands or ribbons in opposite directions upon a core which it is desirable to protect from injury. Telegraph ropes and cables are covered in this way, a fibrous coating saturated with a suitable adhesive composition being interposed between the coiled bands to preserve the metal from decay, and other plans are resorted to for the same purpose.

3rd. Refers to the construction of both solid and hollow *metallic rods* by combining longitudinally rods or pieces, severally *having in tranverse section a segmental forms*; upon these are *closely bound spiral coils of wire ribbon*, and the whole is after-

wards immersed in a bath of molten zinc. In some cases the binding coils are dispensed with, the segmental strips being compacted by passing through dies and thence through the bath of molten zinc.

4th. Relates to the machinery employed.

[Printed, 8d. Drawing.]

A.D. 1855, May 31.—N° 1238.

WHARTON, EMANUEL.—(*Provisional protection only.*)—This invention, relating to the manufacture of seamless metal tubes, consists—

1st. Of a machine adapted to rolling, with one set of four disc rollers, various sized tubes of copper, brass, or other alloys. These disc rollers have one circumferential groove round their periphery, and their axes are so disposed relatively at right angles that the grooves meet at a central point and form an octagonal aperture, which is capable of enlargement by the adjustment of the machine. The metal prepared to form the tubes is cast in the form of a cylindrical ingot, and is reduced and gradually drawn out into the form of a tube by successive passes between the rolls, which have a reciprocating movement, a mandril secured between the grip being employed to support the ingot internally during the operation. The tubes are afterwards passed through hemispherically grooved rollers or suitable dies, for giving them circularity.

2nd. A machine for bevelling the edges of wrought-iron plates and bending them into cylindric forms whilst in a heated state preparatory to welding the seams. This machine operates by means of three pairs of rollers. The first pair bevels the edges of the plates or skelps, and carries them forward to the second pair, which, aided by an oval block, gives them a trough-like form, and the third pair makes them cylindrical upon a mandril, which is secured in the grip or central point between the rolls.

3rd. Consists of a modification of the last bending appliances, the heated skelp being passed between two pairs of rollers, and immediately through a conical die.

4th. An apparatus in which are arranged circular steel cutters for shearing or cutting off any superfluous metal or fins formed upon the surfaces of tubes during the process of manufacture.

[Printed, 4d. No Drawings.]

A.D. 1855, June 20.—N° 1406.

**LONGRIDGE, ROBERT BEWICK.**—(*Provisional protection only.*)

—This invention, relating to the construction of steam boilers and malleable iron tubes, is described by the inventor as follows :—

1st. “Making cylindrical boilers or tubes of flanged rings without any joint or seam, the said rings being connected by rivets or bolts through the flanges.

2nd. “Making such rings corrugated for the internal flues of steam boilers. To make the rings as nearly cylindrical as possible I propose to flange and round them by machinery, by which means I shall obtain increased strength, owing to the rings being cylindrical and free from joints, which cannot be the case with the present mode of construction. And I shall also obtain increased heating surface and strength in the corrugated flues, as well as increased durability owing to the rivet heads not being exposed to the flame.

[Printed, &c. No Drawings.]

A.D. 1855, June 25.—N° 1450.

**PAGE, JOHN.**—This invention, relating to the moulding or shaping of metals, refers chiefly to the moulding of metal pipes and articles more or less cylindrical, in which process core bars capable of expanding and contracting diametrically are employed. These core bars are severally composed of a number (four, less or more) of longitudinal sections, each segmentally curved, and all so combined together as to be capable of a converging or diverging adjustment, for the purpose of more or less altering the external diameter of the core bar, so as to adapt it to pipes of various sizes, instead of having a separate core bar for each size of pipe. The segmental sections which collectively form the correct contour of the bar, are supported by a central spindle screw-threaded at one end, by means of which a longitudinal movement is imparted to a series of inclines or wedges, disposed at intervals in its length inside, which inclines engage with projecting wedges or inclines with which the segmental pieces are severally furnished. The internal arrangements for forcing out or drawing in the segments (of which two modifications are described) may be varied.



The coating of the core bar with loam in a thin plastic state is an after operation, performed in a heated vertical mould box, made slightly larger than the finished size of the core, in order to compensate for the shrinkage of the loam whilst drying. The loam is moistened and worked with hot water, and the mould box is inclosed by a steam jacket for the purpose of drying the loam almost as fast as it is laid on the core bar, which is caused to revolve in the mould box during the operation, whilst the loam finds its way downwards from a hopper, and fills the annular space between the core bar and the mould.

[Printed, 10d. Drawing.]

A.D. 1855, July 24.—N° 1680.

BROOMAN, RICHARD ARCHIBALD.—(*A communication.*)—This invention, relating to the manufacture of seamless tubes, refers principally to the roller dies employed in the process; it is supplementary to a prior communicated invention, in respect of which, letters patent, dated March 5, 1853, were also granted to this patentee. The present invention “consists in bevelling off or  
“ otherwise cutting away the corners of each of the rollers, so that  
“ a series of grooves will be formed around the inner circumference. There are two objects in forming these grooves. The  
“ first is to ease the metal at the joints, the action of the rollers  
“ being such, that by reason of their radial position the edges  
“ approach and leave each other at an angle. The consequence  
“ is, that the metal of the tube as it is being drawn through rises  
“ up and is taken in by the sides, thus forming thin feathers at  
“ the joints, while at the same time this jams the set up, so as to  
“ impede the free action of the rollers. The grooves therefore  
“ afford complete relief in this respect. The second purpose  
“ accomplished by this formation of grooves in the tube is that  
“ thereby its subsequent separation from the mandril may be  
“ effected. In all seamless tube machines it has heretofore been  
“ found necessary to use a taper mandril in drawing the same  
“ through the reducing dies, in order subsequently to effect the  
“ withdrawal of the mandril. In the improved machine a mandril  
“ of uniform diameter is employed, so as to have tubes of equal  
“ bore throughout; by subsequently passing the tube through  
“ another die, the rollers of which form a complete circle the  
“ size of which is slightly larger than the main body of the tube,



" the ribs are levelled, and thereby the tube becomes slightly enlarged, thus relieving the mandril, and allowing it to be readily withdrawn."

[Printed, 6d. Drawing.]

A.D. 1855, August 9.—N° 1800.

DELPÉRDANGE, VICTOR.—This invention relates to a mode of jointing or connecting pipes, such pipes having externally round each end, a hemispherical bead. Over the two ends of the pipes which are to be connected together is drawn a sleeve, consisting of a short length of vulcanized india-rubber tube, and outside that, so as to completely encircle it, is placed a screw clip or collar, which has two ear pieces pierced with bolt holes; these pieces project at a right angle from the pipe when the collar is adjusted over the sleeve, and they are drawn together by a bolt and nut. By this means the packing sleeve is brought into close contact with the beads on the pipes, which by the pressure are impressed into the packing material, whereby the latter is brought down close over the back of each bead by the two edges of the collar, which are turned inwards for that purpose, a small piece of thin metal plate being placed over the sleeve, so as to be under the ends of the collar when they are drawn together by the bolt. Elbows and pipes intended to be connected at any angle deviating considerably from a direct line, may either terminate at corresponding angles, or the collars may have increased width on one side to permit of the ends of the two pipes being separated on one side, and placed at the requisite angle.

[Printed, 10d. Drawings.]

A.D. 1855, September 6.—N° 2016.

SCHWARTZ, THEODORE.—This invention of apparatus designed for heating or cooling aeriform and liquid bodies, consists in augmenting the action and efficiency of the agent by which heat or cold is produced, by increasing the metallic surface of the tube or article through which it is transmitted and given out, and for this purpose pipes, tubes, and articles employed for heating and cooling purposes, have the external or internal surface increased by projecting ridges or indentations.

Pipes applicable as flue tubes in the construction of steam boilers, have attached to them projecting ridges in the form of

flanged rings, or of spirals. These rings and spirals are fastened on the tubes externally at close intervals throughout their whole length by brazing, soldering, or otherwise, and present a greatly increased surface to the fluid by which they are surrounded, and act as efficient distributors of the heat, which by conduction passes through the tubes. Longitudinal projecting ridges may be made either inside or externally on tubes by means of an ordinary draw-plate, and other plans are devised for attaching wire ridges by pressure.

[Printed, 8*d*. Drawing.]

A.D. 1855, September 14.—N<sup>o</sup> 2075.

GOMME, THÉODORE, junior, and BEAUGRAND, CHARLES EUGENE AUGUSTE.—This invention relates chiefly to the manufacture, by mechanical appliances of divers articles of domestic use, the metal being worked by stamping dies, rollers, modelling tools, and other contrivances, instead of as heretofore with the hammer by hand labour. The invention is also applicable to the manufacture of metal tubes, which may be perforated or stamped when in a heated or cold state by the same process.

The bottoms of such articles as coffee pots, kettles, etc., are made to assume the necessary concavity of form by stampers or dies, in a press worked direct either by steam or hydrostatic pressure, and the fulness or contour of the body portion is obtained by means of rollers appropriately formed, and set on the end of a lathe mandril at suitable angles to operate inside the article, whilst modelling tools and burnishers are applied outside to give it the required configuration, smoothness, and polish.

[Printed, 10*d*. Drawings.]

A.D. 1855, October 9.—N<sup>o</sup> 2249.

PARSONS, PERCEVAL MOSES.—This invention of means for connecting and securing the joints of pipes and tubes, consists of a socket or collar having internally one or more annular recesses or wide grooves, forming when slid over the contiguous ends of two pipes, annular chambers for the reception of spun yarn or other suitable packing, which is drawn in through a hole in the collar, when either the latter or the pipes are turned on their axes; the end of the packing is made fast inside the annular chamber either to the pipes or the inside of the collar, and the

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turning is continued until the packing has been repeatedly lapped or wound on the pipe ends, and is thoroughly compressed in the annular chamber, and it is stated secures a tight joint.

"In some cases the socket may be attached to or form part of one of the pipes, or it may be composed of two or more separate parts, suitably held together, and one of its parts only may be made to rotate. It may also in some cases be provided with two or more apertures for the introduction of the packing. The packing may be composed of any suitable material, such as spun yarn, rope, hempen, leather, gutta percha, india-rubber, or other cord, or of strips or bands of the same materials, or of cloth, canvas, metal, &c., and the annular chamber or internal form of the socket and the aperture in it must be modified to suit the kind of packing intended to be used."

[Printed, 8d. Drawing.]

A.D. 1855, October 27.—No 2400.

STIRLING, JOHN DAVIE MORRIES.—This invention relates to the manufacture of steel tubes from steel tubular ingots and cylinders, which are cast in highly heated moulds; after the metal is poured into the moulds they are kept in a heated state, so that the metal remains at a red heat for some time before it is allowed to gradually cool, thereby combining in one operation the processes of casting and annealing. The moulds which are preferred are those made of sand or loam. After the casting is removed, it may be extended or drawn out to form a tube by hammering, drawing, or rolling, as described in the specification of a former patent granted to this inventor, and bearing date February 27, 1854, No. 472.

[Printed, 4d. No Drawings.]

A.D. 1855, November 9.—No 2527.

PRITCHARD, THOMAS.—(*Provisional protection only.*)—This invention relates to the manufacture of welded iron tubes, for which purpose a peculiar form of die is employed. "The tube as it is formed and passes through the die receives a succession of pressures, by which the diameter of the tube is reduced progressively, and the weld most effectually produced by once heating the iron. The die is formed with a bell-mouth at its



“entrance, then it has a chamber or space of larger diameter than the contracted end of the bell mouth, such chamber or space being made with lateral holes for the passage away of scale or scoria. The die is then again contracted to a diameter somewhat less than the first contraction; there is then again another enlargement or chamber having holes therein for passage away of scale or scoria. The die is then again contracted to a somewhat less diameter than the second contraction; hence the tube in passing receives three pressures and is contracted in diameter three times. It is preferred that the die should be in one piece, but this is not essential.”

The strip or narrow plate intended to form the tube “is to be heated to a welding heat from end to end, and is then to be welded on or tacked while in the furnace to a round bar of iron of a diameter somewhat less than the smallest diameter of the die. The die is then put on the round bar of iron which is at the front of the furnace, and is then slipped down till it comes in contact with the end of the strip by the bell-mouth end of the die, when by pulling round the bar of iron so attached to the strip by means of a chain or otherwise the strip is drawn through the die, and forms a tube.”

[Printed, 4d. No Drawings.]

A.D. 1855, November 26.—N° 2657.

WILKES, JOHN.—This invention relates to the manufacture of tubes from cast or cylindrical ingots, which are drawn out and gradually reduced by passing them repeatedly between two rollers circumferentially grooved to correspond one with the other, so that when their respective surfaces are in close contact the grooves (which are nearly hemispherical in both rollers) form openings between them slightly elliptical, the depth being somewhat less than the breadth; the size of the several grooves in each of the rollers progressively increases, and the ingot placed upon a mandril in a heated state, is first passed through the largest pair of grooves and then through the next size, and the next in succession, until it is gradually reduced to the size of the smallest grooves. The reduced ingot is then placed between other rollers furnished with a series of smaller grooves graduating in the same manner to the required finished size of the tube, the last pass being through

grooves which when together form a perfect circle. The mandril it is stated may after the process be removed from the tube without difficulty.

[Printed, 6d. Drawing.]

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## 1856.

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A.D. 1856, January 7.—N° 56.

NEWTON, ALFRED VINCENT. — (*A communication.*) — The object of this invention relating to the manufacture of rods, shafts, and tubes of iron and steel, is to increase the tenacity of the metallic fibres, and render the metal more capable of resisting sudden or continuous strains. To this end one extremity of the bar is, after being heated to a welding heat in a forge or furnace, fixed in a vice, and the bar is then twisted or turned on its axis; the heated part yields and the grain takes a spiral course, after the direction of the fibres in twisted yarn. The metal whilst hot is subjected to the operation of hammering, which welds the fibres and solidifies the mass. A second portion of the bar is then heated and subsequently treated in the same manner, and this is repeated until the operation has been performed upon the bar throughout its whole length. It is stated that iron so treated is specially adapted to the manufacture of fire-arms, the direction of the grain or fibre rendering them less liable to wear and injury than the metal of bars twisted by the ordinary process.

[Printed, 4d. No Drawings.]

A.D. 1856, January 18.—N° 137.

MARSHAL, WILLIAM. — (*Provisional protection only.*) — This invention relates to the rolling of wrought iron adapted to the manufacture of gun barrels, tubes, and tubular articles. Instead of the flat iron commonly employed for the purpose, the iron bars during the process of manufacture are rolled into the form of a square prism or approaching thereto. By suitably grooved rolls a gutter on one side is then formed throughout its whole length; this is deepened by successive rollings and the angles being rounded, it (in transverse section) assumes the form of the letter U. By subsequent rolling the upper sides or edges of the bar are turned towards each other, and



brought into or nearly into contact, thereby approaching a tubular form. This operation is performed by one pair of rolls, in which are five or more grooves relatively of such sizes as are necessary to produce the effect.

It is stated that the welding of the tube is to be performed subsequently by the gun barrel or tube maker, and that the expense of rolling bars into a tubular form, is not greater than rolling them as heretofore.

[Printed, 4d. No Drawings.]

A.D. 1856, January 22.—No 165.

GEDGE, JOHN.—(*A communication from Mr. Blanchefort.*)—(*Provisional protection only.*)—This invention relates to apparatus designed for "bending, edging, and soldering tin," whereby larger sheets than heretofore may be operated upon; for this purpose it is proposed "to employ two wooden cylinders, " mounted horizontally the one above the other; between these " cylinders a space the thickness of a sheet of tin is left to allow " of its being arched on one of the cylinders, and partly embedded " therein is a band of sheet iron, presenting a curvature between " it and the cylinder, so that the edge of the sheet of tin can " slide under it the whole of its length; these being in position, " the cylinder is turned by a handle, the tin rolls on, and its edge " takes the form of the curved iron. To solder this sheet it is " proposed to slide a wooden mandril between an iron rule and " the cylinder; the iron rule serves to press the tin against the " mandril by means of a ring to be passed over the end of the " rule which is bevilled. In this manner the two edges to be " soldered are easily nipped or pressed together, and the soldering " is easily effected."

To form the "roll or sausage" on gutter tin, it is proposed to fix 3 ft. 3 in. apart on a plank, two pins with eyes; "these serve " to support an iron rod, grooved in its whole length, so as " to allow the edge of a sheet of tin to enter a sufficient depth " in its entire length; between the two pins is to be fixed a plate " of sheet iron much bent in its lower edge. The two pins are " to be driven sufficiently into the plank so as to allow only " space between the rod and the sheet iron for a sheet of tin. A " sheet of tin being presented to the rod, and its edge inserted " into one of the grooves is bent over the iron and finding itself

"stopped by the curvature of the iron is forced to roll over the rod which is to be withdrawn after one turn and so the roll or sausage is formed on the tin plate.

[Printed, 4d. No Drawings.]

A.D. 1856, January 31.—N° 262.

**KINNIBURGH, JOHN.**—(*Provisional protection only.*)—This invention relates to the moulding of hollow cylinders such as pipes and articles of similar form, the core bars which are used being capable of expansion, and of collapsing diametrically after the casting is made. These bars are formed in three or more longitudinal segmental sections, represented by, say three curved plates, one of which is a fixture, and the other two are made adjustable by means of eccentrics upon a central spindle, which has liberty to revolve. Another internal part of the core consists of a long wedge piece, which moves radially to and from the central spindle and fits between the contiguous edges of the adjustable segments, which are bevelled to correspond, the other edges of these segments being hinged or connected, one to each side of the segment which is fixed. In order to remove the core bar after the casting is made, by turning the spindle backwards the wedge piece is drawn in, and the two adjustable segments are caused to collapse, their free edges overlapping. Instead of eccentrics, the movable parts may, it is stated, be actuated by rack and pinion movements, or by other mechanical contrivances.

[Printed, 4d. No Drawings.]

A.D. 1856, February 14.—N° 380.

**McFARLANE, WALTER.**—This invention relates primarily to the adaptation of cast-iron in the construction of houses and other structures which it is stated "may be built and firmly connected in their details without the slightest aid from screws, bolts, nails, or other loose binding apparatus." The main portions of these erections such as the pillars, arches, door and window frames, wall plates, and the other principal parts are formed to fit together with dovetail mortices and tenons or dovetailed grooves and feathers, and the movable doors, hinges, latches, fastenings, and other fittings, utensils and appliances, are cast at two operations, in some cases one part loose upon the other.

Rain-water pipes and ducts are cast with side branches for lateral connections, cores of green sand and hollow branch patterns of the finished size being used. The mould and core of the branch is so placed that the main core of the pipe rests upon it, the end of the branch core being in contact therewith.

[Printed, 1s. Drawings.]

A.D. 1856, March 7.—N° 570.

DOWNIE, JOHN.—This invention relates to a mode of moulding or shaping metals and other materials, the model pattern having motion whilst the process is going on. The system is applicable as described in the moulding of various hollow articles; including cast iron socket pipes, rain water pipes etc., the cores being prepared in the ordinary manner.

The modification of the moulding apparatus adapted to form the external moulds for two cast-iron pipes, consists of a kind of box frame, its top side or plate being a plain smooth surface, wherein are two apertures corresponding to the extreme length and diameter of the pipe pattern. Two pipes are moulded at once; a pattern being laid in each aperture is supported on the ends of the moulding frame; the ends of the pattern being for that reason purposely prolonged. The flasks into which the moulding sand is rammed are made to fit over the top surface of the box frame, and any one flask in the set will fit and pair with either of the rest. When the patterns are adjusted in the apertures, exactly one longitudinal half is seen above the surface. The flasks are then in succession placed over the patterns, and when the sand is rammed in, the patterns by means of eccentrics on their ends are caused to sink in the apertures, and being turned the while, they smooth or sleek the surface of the mould.

[Printed, 1s. 4d. Drawings.]

A.D. 1856, March 8.—N° 578.

STEWART, DAVID YOOLOW.—This invention relating to the moulding and shaping of metals, refers to the construction of the core bars employed in the process of casting pipes and hollow cylinders, such core bars being composed of separate pieces relatively capable of mechanical expansion and contraction, so that the diametral size of the core bar may be increased or diminished at pleasure. One of these core bars is composed of, by preference



four longitudinal segmental sections, perforated with holes for the escape of air, and having inclining edges which lap, the edge of one upon the opposite edge of another when the sections are placed in longitudinal circumposition round a central shaft or mandrel, whereon are fixed two strong disc plates with inclined edges one plate near each end. The edges of these discs are also formed to embrace and engage with inclines and corresponding parts fixed at the back of each of the segmental sections, and the expansion may be effected by a longitudinal movement of the spindle by means of the inclines, or by rods or other contrivances acting on intermediate parts and drawn endwise by screw nuts or otherwise.

[Printed, 1s. Drawing.]

A.D. 1856, April 5.—N° 825.

WEBSTER, JAMES.—The object of this invention relating to the manufacture of metallic tubes, is to produce tubes which shall possess a limited amount of elasticity and flexure; these tubes are made of brass, copper, or other metal or alloys, and taken in the plain ordinary state are submitted to a corrugating process, producing at close intervals throughout their whole length, a series of annular indentations, which imparts a degree of flexibility to them. This may be increased by applying pressure to the ends of a tube so as to compress it endways, and thereby plait the corrugations more or less close.

The machine employed to corrugate or indent the tube annularly, operates upon the tube by means of three rollers, severally made up of a series of separate discs placed side by side loose upon their respective axes. These rollers disposed parallel relatively, are placed horizontally in trigonal position, so as to press upon the tube which occupies the central place upon a mandril, that is supported between headstocks similar to a lathe; burnishers or pressing tools may be used instead of rollers to indent the tubes, which gradually shorten as the operation proceeds.

[Printed, 8d. Drawing.]

A.D. 1856, April 14.—N° 885.

DAVIES, GEORGE.—(*A communication from Mathieu Joseph Receveur.*)—This invention relates to a mode of uniting masses of

cast iron, such as rollers, conduit pipes, and other articles, either broken or otherwise, and its practical application is described in the process of repairing the broken spindle or journal of a roller

“ If the journal is broken at some distance from the shoulder, the fracture should be reduced to a level surface at about an inch or so from the shoulder; but if the fracture is flush with the shoulder it does not require to be levelled. The ‘roll’ is placed in a vertical position in a pit with the broken surface upwards, and then heated by means of a coke fire placed all round it, and enclosed by a grate or fire bricks. As soon as the roll has become sufficiently heated, that is to say, when it is red hot, the fire and grate or bricks are quickly removed, and a ‘flask’ or box (the top of which is level with the shoulder) is placed round the ‘roll’ and rammed full with sand. A mould in dry sand or loam for forming the journal is then placed over the centre of the ‘roll’; this mould is provided with a hole at a little above the level of the line of the junction to be effected. The mould is surrounded by a second ‘flask’ or box, provided with a corresponding opening, and the interstice or space between rammed with sand, care being taken to leave a channel of communication between the two holes; a quantity of iron in a fused or liquid state is then poured into the mould, so as to have a continuous bath of fused metal upon the surface to be united, the surplus or excess running off through the channel or opening above named. When a sufficient quantity of metal has been poured in to cause the fusion of the surface, the discharge opening is closed or plugged, and the mould filled with molten metal. A second mould, intended to form the end of the ‘roll,’ is then placed over the former, and is surrounded by a ‘flask’ and rammed tight with sand; a further quantity of molten metal to fill this mould is then poured in, and the operation is complete. On cooling the new metal will be found to have effected a perfect junction or union with the old.”

[Printed, &c. Drawing.]

A.D. 1856, April 19.—N° 941.

WILKES, THOMAS.—The object of this invention is to improve the mode of manufacturing tubes of copper and copper alloys. It is described by the inventor as follows:—“ I take thick hollow cylinders of copper or alloy of copper, the said thick hollow cylinders being made by casting or otherwise. I subject the



“ said thick hollow cylinders to the operation of rolls, so as to  
 “ elongate and diminish the diameter of the said hollow cylinders,  
 “ and thereby convert them into such tubes as are required in  
 “ commerce. In effecting the said rolling, I employ rolls pro-  
 “ vided with grooves, the said grooves being of a semicircular  
 “ section, or having a section the curve of which is a portion of a  
 “ circle less than a semicircle. The said grooved rolls are made  
 “ in the manner in which grooved rolls are made for other pur-  
 “ poses, and I therefore do not think it necessary more fully to  
 “ describe or to represent the said rolls. The tube has an internal  
 “ support or mandril while being subjected to the action of the  
 “ rolls, and it is rolled in a series of progressively diminishing  
 “ grooves of the kind described until it has been sufficiently  
 “ elongated and reduced in diameter. The hollow cylinder may  
 “ be rolled either hot or cold, according to the nature of the  
 “ metal or alloy of which the said hollow cylinder is composed.”

[Printed, 4d. No Drawings.]

A.D. 1856, May 9.—N° 1095.

POTTS, FERDINAND and VANN, THOMAS.—This invention relates to apparatus designed for ornamenting or twisting, and for floating, polishing and burnishing metallic tubes.

1st. Describes the apparatus and mode of double twisting a tube with five reeds running spirally in opposite directions along its surface, the spirals in one direction, say from left to right, crossing or intersecting the spirals which run from right to left. “A circular collar is prepared, with a concentric taper hole formed through it, the internal form of the hole defining the shape and size of the tube we desire to twist. This collar is set up and fixed in connection with suitable gearing on a common draw bench, and a piece of metal tube, sufficiently large to receive the true form of the spiral reeds, formed on the inside of the hole. This tube must be made small at one end for the purpose of readily passing through the hole, to be seized by the pliers appertaining to the bench. The draw-chain being set in motion, as well as the gearing before described, the tube will be pulled through the twisted hole or collar in a direct line, while the collar is being made by the gearing to revolve” as the tube passes through it, and thereby generates the spiral. In order to double or cross twist the tube, a second collar is employed and caused to revolve in the contrary direction whilst the tube is

passing through it, the inclination of the grooves in the hole through this collar being also reversed. During this second operation the tube needs internal support on a mandril or otherwise.

2nd. The apparatus for floating, burnishing, and polishing metallic tubes is supported on a horizontal bed, and operates by means of a series of floats placed equidistant, so that they operate simultaneously at different parts of the tube by a reciprocating motion, during which time the tube is caused to make one complete revolution. When the machine is used for polishing, the floats are either removed or they are covered with buff leather, and for burnishing, the floats are removed and replaced by steel burnishers.

[Printed, 1s. 4d. Drawings.]

A.D. 1856, May 10.—N<sup>o</sup> 1105.

BROOMAN, RICHARD ARCHIBALD. — (*A communication.*) —

This is an invention of machinery adapted to the manufacture of tubes and pipes, and also applicable in lieu of rollers for reducing the size of bars and rods. It consists in the particular mode of arranging and actuating four segmental pressing dies, which operate by a succession of reciprocating motions, as distinguished from the process of rolling or of drawing through dies. "The dies may be considered as sectors, the edges of which are hollowed out with a tapering curve. Four of these may conveniently form a set, the hollows being brought together at the centre, making a hole, and because of the taper the hole will differ in size in different sections as the edges of the sectors roll together, that is to say, if laid out in a straight line the hole would be conical. In operating, the sectors at starting are in such position that the hole formed within them is at its greatest size, the end of the ingot on its mandril is then thrust in a short distance, when the faces of the sectors are made to roll upon it towards its end to the full extent of their motion, the central hole gradually contracting all the while, and of course squeezing the end of the ingot down into less size, the metal extending itself, or rather that portion of it subjected to pressure, for the main body or part of the ingot not yet acted upon remains stationary. The sectors now rock back to their former position, when a feed takes place and another portion is reduced, and so on."

Instead of operating the sector dies by a vibratory movement, they may be placed on axes and caused to revolve; such an arrangement (it is stated) would be useful in making short lengths of tube from hot metal, likewise pistol and gun barrels.

[Printed, 10d. Drawing.]

A.D. 1856, May 22.—N° 1223.

**CUTLER, JOB.**—This invention relates to the manufacture of metallic pipes or tubes from sheet metal, such tubes being made uniformly cylindrical externally, and tapering or conical inside. The strip of iron, in width to correspond with the circumference of the intended tube, is bevelled along the jointing edges and then bent and turned up into a cylindrical form; it is then placed in a furnace, and when at a welding heat is taken and passed through the groove of revolving rollers, and over a bulb or mandril disposed in the center of the groove, and by this means the welding of the edges together is effected.

The tube is then passed along a mandril rod to the next set of rolls, the grooves whereof gradually vary in depth, so that the tube is regularly reduced in size from one end to the other, the process being repeated by other rolls and bulbs until the required size and tapering form is obtained. The tube is now conical outside and parallel inside, being at this stage of the process exactly the reverse of what is required. The change is effected by passing the tube in a heated state between rollers with grooves of uniform depth, and in size corresponding exactly with the smallest end of the tube, which is thereby brought to a parallel condition externally throughout its whole length, whilst the compressing effect of the rollers has gradually reduced the size internally towards the end that was largest, and rendered the tube internally conical, the metal being much thicker at one end, gradually diminishes in strength towards the other. Such tubes it is stated are advantageously applicable to many purposes, and more particularly for the flue tubes of steam boilers. Pipes of other metal are made conical internally by treating them in the same manner, and lips, bell-mouths, or flanges may be formed on the end of a tube if required.

[Printed, 1s. 6d. Drawings.]

A.D. 1856, June 4.—N° 1330.

**HATTON, EDWARD.**—This invention relates to the manufacture of plain tubes, conical or otherwise, from sheet metal, and to a



mode of ornamenting the metal previously by a kind of embossing process, for which purpose two machines are described.

The first machine operates by means of rollers, between which the metal is passed. These rollers are caused to revolve at a uniform speed by suitable gearing, the revolutions of one in relation to the other exactly corresponding. Upon the surface of one roller the design is formed in relief, and upon the other it is intaglio, both so exactly corresponding that, as the sheet of metal is passed between them, it is impressed by the design in relief on one roller into the intaglio design on the other. A third roller, appropriately placed at the back of the machine, turns up the sheet and causes it to lap round one of the other rollers, whence after the operation it is removed and the edges are brought together and soldered, preferably in a heated state.

The other machine operates after the manner of two dies, engraved or fluted respectively intaglio and relief.

The moving die is a kind of mandril jointed at one end to the die table, upon the surface of which table is formed a semi-circular groove which constitutes the fixed die, into which the sheet of metal is pressed by the circumferential surface of the mandril, when the free end of the latter is brought down to a horizontal position by a lever, to which it is connected by a suitable link. The die table may be furnished with a series of grooved dies, and be fitted with a corresponding series of impressing mandrils.

[Printed, 6d. Drawing.]

A.D. 1856, June 11.—N° 1385.

BAYLISS, WILLIAM.—This invention relates to a method of indenting tubes, for the purpose of forming upon them externally spirally grooved ornamentation or longitudinal flutes or beads.

The tube about to be subjected to the process is placed upon a mandril, which has the form externally that it is intended shall be given to the tube, and this is effected by a pressing tool, which is mounted on the slide rest of an ordinary screw cutting lathe, the mandril carrying the tube being placed between the headstock centers, is caused to revolve whilst the slide rest moves along the lathe bed, so as to generate an inclined curve corresponding with the angle of the spiral curves on the mandril. The spiral may consist of either a series of grooves or a series of beads, and this form is gradually imparted to the tube by the repeated pressure of the tool, which *must be of corresponding form*. When the series

of flutes or of beads on the tube are straight, then the mandril is not (during the operation of the tool) required to revolve; these straight tubes may be operated upon with the same effect in an ordinary planing machine, furnished with headstock centers to support the mandril. Taper tubes may be easily slid off the mandril after the process, but those of uniform diameter throughout may, if difficult of removal, be suddenly expanded and loosened by heat.

[Printed, 4d. No Drawings.]

A.D. 1856, June 13.—N<sup>o</sup> 1401.

WHITMORE, WILLIAM RICHARD. — (*Provisional protection only.*)—This invention relates to the manufacture of the flue tubes adapted to the construction of multitubular steam boilers. The inventor says :—" Instead of making the tubes of a circular section, which is the ordinary plan, I make them triangular, by which a greater heating surface may be obtained in a given space, and I prefer to place these triangular tubes in rows, leaving continuous uninterrupted channels between the rows to facilitate the passage of the heated water and steam; these channels may be parallel or tapering, or of variable width."

The triangular tubes may be manufactured by processes similar to those employed in making cylindrical and other tubes, their angles being either perfect or more or less rounded.

[Printed, 4d. No Drawings.]

A.D. 1856, July 8.—N<sup>o</sup> 1610.

HERTS, ABRAHAM.—(*A communication from William Webster.*)

—This invention relates to the construction of machinery designed for rolling up or bending sheet metal into tubular and other curved forms suitable for stove pipes, speaking pipes, locomotive tubes, and other purposes. The edge of the sheet of metal which is first cut to the required size (allowance being made if desirable for an overlapping seam to be subsequently soldered or welded) is inserted in a longitudinal groove in a mandril, which for light work may be of wood covered with sheet iron. "This mandril, with the sheet inserted therein, is placed inside a hollow 'non-axled' metal cylinder, which is supported on external friction rollers, and is fitted or formed internally at one or both ends with cog teeth, which gear into a spur pinion



“ running loose on a stud, and this pinion in its turn gears into  
“ a second pinion fast on the end of a long roller inside the  
“ hollow cylinder before referred to. A second roller is also  
“ placed inside the cylinder, and works in bearings in the ends  
“ of two levers, by which means it may be raised or lowered as  
“ desired.”

“ By imparting a rotary motion, either by a winch handle or by  
“ driving ordinary pullies, to the fixed roller, a similar motion  
“ will be transmitted through the loose pinion to the hollow non-  
“ axled cylinder, and the mandril, by its contact therewith, will  
“ be caused to revolve and roll up the sheet of metal into a tube,  
“ the two rollers serving to press the metal slightly round the  
“ metal as it revolves. By slight modifications two or more  
“ tubes may be rolled at one time in the same machine, it being  
“ necessary for that purpose to multiply the pressing rollers  
“ accordingly.”

[Printed, 16d. Drawing.]

A.D. 1856, July 12.—N<sup>o</sup> 1645.

ORTET, BENOIT FRÉDÉRIC.—This invention relates to the production of a metallic substance called “ferreine,” obtained from iron pyrites either alone or combined with sulphur, or products containing sulphur, and to applying such substance to the manufacture of cisterns, basins, pipes for conveying water, pavements, covering for roofs, foundations, and for other purposes.

For the production of the ferreine, two boilers of given capacity, connected by a tube adapted to their lids, are employed. In one boiler is placed yellow iron pyrites or other product containing sulphur, sulphuret of iron on account of its cheapness, being preferred. In the other boiler is placed powdered pyrites or iron ore. “The fire under the first boiler being lighted, the pyrites  
“ is melted, and the sulphur (about fifteen per cent.) given off  
“ under the influence of the heat distils over to the second  
“ boiler, heated to a low temperature, by means of which the  
“ sulphur combines with the iron ore in the second boiler, and  
“ produces a bisulphuret of iron” (termed by the inventor ferreine), which he produces in various ways, according to its intended application.

The different changes which the ore undergoes render it unalterable under the effect of either air, water, or acids.

"The ferreine when produced must be submitted to the moulding and casting processes for the purpose of obtaining the required result, when it may be painted, gilt, or bronzed like the metals."

[Printed, 4d. No Drawings.]

A.D. 1856, July 18.—N° 1697.

HAMILTON, JOHN, junior.—The object of this invention is the bending of sheet iron for the manufacture of conical tubes, for which purpose conical rollers (by preference of steel) are employed, the metal lapping round one roller, which rests upon two other rollers, the axes of all the three rollers being relatively parallel. The sheet iron ordinarily used gauges in thickness to No. 15, and it is cut to the proper shape for producing the tapering form of the size of tube required. After the sheet is bent to the taper form, it is removed from the roller and confined by hoops whilst the lap joint is rivetted, a process performed by hand. These tubes are applicable for telegraph posts and for many other purposes.

[Printed, 10d. Drawing.]

A.D. 1856, July 25.—N° 1765.

SPENCER, GEORGE.—(*A communication.*)—This invention relates to a pipe coupling, adapted to connect the pipes which convey the feed water from the tank of a tender to the locomotive. This coupling is designed as a substitute for the ordinary bolt and socket couplings, and consists in the use of two thick rings of india-rubber by preference vulcanized; these rings are slid one on to the end of each of the two pipes which are to be connected, against a loose collar previously placed upon the ends of the pipes, which are then inserted in the coupling tube, both ends whereof are 'screw-threaded externally.' The coupling tube is gradually enlarged towards its mid-length internally to afford free space for the lateral working of the ends of the two pipes, which also slide to and forth through the rings, the latter being pressed into steam-tight contact therewith by the collars, which are screw-threaded internally and screwed on to the ends of the coupling tube, and by compressing the rings cause their lateral dilation. There are altogether four modifications of this coupling shown and described.

[Printed, 6d. Drawing.]

A.D. 1856, August 4.—N° 1837.

DAFT, THOMAS BARNABAS.—This invention relates to the process of casting pipes with a socket or faucet at one end, and a plain end or spigot at the other, the object being to make the spigot end of one pipe fit so accurately into the socket end of another, that no packing is required to make a sound joint. To effect this, the two ends of each pipe, respectively the faucet and the spigot, are cast in chill moulds, which fit on to the ends of the pipe pattern or model, and are laid with it in the sand, and left there after the sand mould for forming the intermediate length of the pipe is made, and the pattern lifted out. The inventor states, "the accuracy of this joint is found to be such, that by simply wetting the surfaces to be united, and driving them home, they rust up in a few days, and form a perfectly steam-tight joint, requiring several hundred pounds on the inch to separate. But generally the joints for gas and water purposes may be made by applying a luting of red lead or other suitable material, and in some cases tar will be found to form a sound and durable joint."

Where lightness combined with strength and resistance to separation be required, and where expansion and contraction may be expected, it is preferred to cast spigots at both ends of each pipe, to fit in duplex faucets or broad collars of tough cast or malleable metal, or of wrought iron, which is not liable to split when the spigots at the pipe ends are driven home. If great tension be expected, the ends of the wrought-iron faucets may be closed round the rim of the spigot by hammering.

[Printed, 4d. No Drawings.]

A.D. 1856, August 23.—N° 1968.

JOHNSON, JOHN HENRY.—(*A communication from Messrs. Jackson Brothers, Petin, Gaudet, and Company.*)—(*Provisional protection only.*)—This invention, relating to the process of casting articles in steel, such as railway wheels, tubes, and hollow axles, consists in making such castings in chill moulds which, for the purpose of compacting and strengthening the metal, are caused, during the time of filling or running into them the molten metal, to revolve at a high velocity, at the rate of from 500 to 1,000 revolutions per minute. The chill mould of a wheel is *securely fixed* by nuts and bolts to one end of a revolving

shaft, and upon the melted metal being run in at a central opening, it is instantly thrown from the center and directed against the internal circumference of the mould, rendering it perfectly sound and homogeneous, and entirely free from flaws. When the mould is full a mandril is introduced during its rotation at the central opening, which is smoothed and polished thereby.

The casting of steel tubes for steam boilers is effected in the same manner; the chill mould, which is made in two parts securely held together by ferrules or rings that are driven on, revolving during the process at a high velocity. As soon as the metal is set the casting is removed from the mould, and whilst in a heated state submitted to the rolling mill, and drawn out to the length and size required. If intended for a hollow railway axle, it is reduced and brought to the desired size by the operation of a steam hammer or other instrument capable of producing a similar effect.

[Printed, 4d. No Drawings.]

A.D. 1856, September 2.—N° 2038.

GUYET, PIERRE JOSEPH.—This invention relates to a system of steam brakes, adapted to operate simultaneously upon the wheels of the several carriages throughout a train; two small single action steam cylinders and pistons being fitted to every carriage, effect the working of the brake blocks at each side by means of a pair of toggle action levers, jointed respectively one to the end of a lever actuated by the piston rod, and the other to the back of one of the brake blocks. The steam is conveyed to the several brake cylinders through pipes, and may also be used (according to another part of the invention) for heating the several carriages throughout a train.

In connection with the general arrangement, it is proposed to make the tubes which convey the steam along the train to answer the double purpose of traction or coupling rods, in connection with the draw springs.

The couplings of the steam traction pipes comprise two screw joints and a short tube fitting into each, the joint being kept steam-tight by an india rubber sleeve or ferrule attached to the tubes by flanges or glands, and bound with wire. Two modifications of the arrangements for coupling are also described.

[Printed, 8d. Drawing.]



A.D. 1856, September 8.—N° 2087.

**ESTIVANT, FÉLIX.**—This invention relates to a new system of moulds for casting metallic tubes, principally of copper for drawing out, and for printing rollers. The moulds are made of metal in two longitudinal parts or halves, which are pressed and held together during the casting operation by screws. The cores are made collapsible, and consist of a sheet iron shell, in form cylindrical, and filled with sand to prevent any ingress of the molten metal, the seam of the shell being merely lapped and not welded. In order to obtain castings free from “blebs or bubbles” the mould, which when the casting is made is placed in a vertical position, has three cylindrical cavities. The center cavity is the mould proper, wherein the core is concentrically placed, its lower end fitting into a central orifice in the bottom of the mould, and its upper end is steadied by a reglet. The two side cavities extending to the bottom of the mould one on each side, communicate therewith respectively by narrow openings, which reach from the bottom, upwards to about the mid-length of the mould. The melted copper is poured into the side cavities, in which the dross and foreign matter remain, whilst the pure metal runs through the narrow openings into the mould. Instead of sheet iron, a thin shell of cast iron slightly tapering and longitudinally cut, is filled with sand, and in some cases preferably used to form the core.

[Printed, 10d. Drawing.]

A.D. 1856, September 25.—N° 2251.

**RUSSELL, JOHN JAMES, and HOWELL, JOSEPH BENNETT.**  
—“This invention consists in making tubes from sheets or strips of cast steel previously rolled or formed to the thickness and sizes desired. To make lap-jointed tubes of cast steel, we take a strip of cast steel of the required dimensions, and bevil or scarf the edges to form the joint, then bend it into the shape of a tube, with the edges over-lapping each other, as when making lap-welded iron tubes. The steel skelp or tube thus prepared is then placed in a furnace, and when heated to the proper or welding heat, it is passed between rollers over a mandril, so as to unite or weld the bevelled edges together, and thus form a cast-steel tube, which is then finished by being passed between

“ rollers, or drawn through holes or dies to reduce it to its proper size.”

“ To make a butt-jointed tube, we take a strip of cast steel of the required dimensions, and bend it so as to bring the edges together, or nearly so. It is then placed in a furnace, and when at a welding heat, it is passed between rollers (either without or over a mandril) or drawn through holes or dies, by which means the edges are pressed together, and thus produce a perfect cast steel butt-jointed tube. In order to insure good welds to butt joints, we pass a cutting or scraping tool between the edges of the strip before the welding is effected, so as to clean the edges from dirt or other matter, and thus permit them, when pressed together in the welding process, to touch and meet in every part, by which means a much firmer weld will be effected, and after heating the so prepared turned up strip in a furnace to a welding heat, passing them through dies or holes, or between rollers over a mandril, whereby a more perfect tube will be obtained.”

[Printed, 4d. No Drawings.]

A.D. 1856, September 27.—N° 2265.

LAW, DAVED, and INGLIS, JOHN.—This invention relating to apparatus for moulding preparatory to casting or shaping metals, is supplementary to a prior invention for which letters patent dated May 9th, 1853, were granted to these inventors. The present invention also includes apparatus for forming the socket or faucet portions of pipe moulds. It consists in a modified arrangement of the former moulding apparatus; the ramming spindle is worked both up and down and turned by a gripping box, the action resembling as nearly as possible the operation when performed by hand. After the mould for the outside of the pipe is rammed up, the socket is formed at the lower end by scooping out the material of the mould by an instrument formed with scraping edges, shaped to correspond with the longitudinal section of the socket. The scooping instrument is attached to the lower end of a vertical spindle, and being lowered into the mould is turned to effect the operation. It is made to serve several moulds, being capable of moving about a center, and of radial adjustment; *it is lowered* into the moulds and raised thence by a chain which *passes over a pulley* to a winch. When the pipe is cast with its

socket uppermost, the core is supported in the mould by a disc, and the general arrangements are modified.

[Printed, 1s. Drawing.]

A.D. 1856, October 21.—N° 2472.

ATKINSON, ROBERT DAVISON.—(*A communication.*)—(*Provisional protection only.*)—This invention relating to a method of coating metallic surfaces, such as iron or lead, has for its object their preservation from oxidation, so as to render them capable of use as substitutes for the more expensive metals employed for coppering ships' bottoms, pans, boilers, bars, bolts, tubes and other purposes, and consists in :—

1st. Depositing upon the surface of such plates by galvanic agency or otherwise, copper or brass, the plates being previously prepared for the process.

2nd. Employing sulphate or sulphuret of lead, as a coating to preserve from atmospherical and other influences, surfaces of lead.

[Printed, 4d. No Drawings.]

A.D. 1856, November 13.—N° 2680.

KINNIBURGH, JOHN.—This invention in the art or process of moulding and shaping metals, relates principally to the manufacture of metal pipes and other tubular articles, the internal aperture or bore being formed by core bars capable of expansion and contraction diametrically. These bars are composed of more or less than three longitudinal pieces, each exhibiting in transverse section the segment of a circle. There is a central spindle whereon are fixed two or more eccentrics, which give radial motion to a longitudinal wedge piece that moves in end guides. One segmental piece is a fixture, and the other two are adjustable. It is intended always to keep the core bar as nearly as possible in a vertical position, in order that no deflection or derangement of the segmental sections takes place. The core bar when set to the required diameter is, whilst vertically placed, coated with loam or other suitable material by means of a hopper, which encircles the core bar, and when raised leaves the loam or coating material on the bar, the opening at the bottom of the hopper having the exact size of the intended bore of the pipe; the faucet end of the core is made at the lower end, and shaped to the required form by a suitable scraper. The core bar previous to use is dried in a stove, and when the casting is made, it is loosened therefrom by turning

the central spindle, so as to withdraw the wedge-piece and set the segmental sections free.

[Printed, 10d. Drawing.]

A.D. 1856, November 19.—N° 2731.

JONES, JOHN, and JONES, EDWARD.—(*Letters patent void for want of Final Specification.*)—This invention relates to the moulding and casting of pipes or hollow articles of parallel section; it has reference to the patented invention of David Law and John Inglis, which bears date May 9, 1853, No. 1136, and consists of a moulding apparatus, which operates by means of a rammer spindle. According to the present invention the rammer spindle is held and worked by a cylindrical gripping or nipping box, which turns with the rammer spindle in a cylindrical socket or a reciprocating slide, that gives to the spindle the necessary up and down motion; the spindle is held in the box by wedges. Other mechanical arrangements for actuating the spindle are suggested. After the mould is formed, the enlargement for moulding the faucet is scraped out by an instrument fixed to the end of a rod if the faucet end of the pipe is to be cast downwards, but if at the top, the enlargement may be formed before the mould is removed from the ramming machine. The mould box is moved upon a carriage, the wheels of which run upon rails.

In preparing the cores for pipe casting, a collapsible core bar by preference is employed. This bar is composed of a number of longitudinal segmental pieces or sections of two widths, alternately narrow and wide, the narrow pieces acting as wedges between the wider sections, and causing their expansion or contraction by means of cams or other mechanical contrivance within the bar.

The invention also refers to the mode of testing cast-iron pipes by hydrostatic pressure, and employs five screw spindles instead of one, as more particularly suited to machines capable of testing pipes of large size.

[Printed, 4d. No Drawings.]

A.D. 1856, November 19.—N° 2739.

FOX, SAMUEL.—The object of this invention is to improve the machinery employed in the process of drawing wire and tubes. To this end "the chain to which the drawing pliers are attached, "*passes under a guide pulley, and then ascends and is made fast*



“ to a pulley on an axis above, and its end is fixed to such pulley.  
“ The axis on which the pulley is placed receives a constant rotary motion from any suitable power, which gives motion also  
“ to the drum on which the wire is wound. The pulley is at  
“ times locked to the axis by projections or clutches, which, when  
“ the pulley has made a complete revolution, are withdrawn by  
“ inclines on the face of the pulley, and the workman may stop  
“ the revolution of the pulley, before it completes a revolution,  
“ by means of a lever catch, the end of which when desired, is  
“ made to enter a hole in a collar with inclines, which is also on  
“ the axis, and towards which the pulley is constantly pressed by  
“ a spring, and such collar is arranged to be connected to a fixed  
“ collar on the axis. The drums on which the wire is wound are  
“ driven in the ordinary manner, but apparatus is applied in  
“ order to stop their rotation with greater convenience. On the  
“ axis of a drum a collar is affixed, having on it inclines and  
“ clutches, and the boss is formed with recesses to receive the  
“ clutches; so long as the clutches are in the recesses the drum  
“ revolves with its axis, but when a lever is introduced with an  
“ incline thereon, by which the drum is raised and rests on a  
“ projecting surface on the lever, and the motion of the drum  
“ will be stopped, whilst its axis will continue to rotate, and on  
“ the removal of the lever the drum will again rotate.”

[Printed, 10d. Drawing.]

A.D. 1856, November 19.—N<sup>o</sup> 2741.

FOX, SAMUEL.—This invention has for its object improvements in heating, hardening, and straightening steel wire and tubes, also ribs and stretchers of umbrellas and parasols. Preparatory to the heating operation, the wire tubes or articles are placed in cylinders or tubes of iron or other suitable material, such tubes or cylinders being furnished with annular projections. The furnace chamber is heated by a fire at one end, the hot gases and products of combustion passing directly through it to the chimney flue. At each end of the furnace there is a door, respectively for introducing and taking out the heating cylinders in succession as they follow each other, rolling along channels which receive the annular projecting parts of the tubes, and form guides for them, as they roll forward, the heat and flame being reverberated by the furnace roof.

The straightening of wire or tubes is effected by means of rollers. A large number of tubes is operated upon it at the same time; they are laid through rings, which keep them together upon two horizontal rollers in the channel formed between them, any longitudinal movement or escape of the wires or tubes being prevented by a guard or shield at each end of the group. In this position they are operated upon by a pressing roller, the rings being caused to rotate by the friction of the horizontal rollers, which are driven by suitable gearing, the tubes or wires relatively during the operation being constantly kept in parallel position, but continually changing places with each other.

[Printed, 1s. Drawings.]

A.D. 1856, November 29.—N° 2827.

WRIGHT, LEMUEL WELLMAN.—(*Provisional protection only.*)—This invention relates to machinery adapted to the bending of sheets and plates of metal into the form of tubes. It “consists “ in certain arrangements of levers and pressers driven or guided “ by cams, in such manner as to press the plate from which the “ tube is to be formed over and around a mandril supported in “ suitable frames. In some cases the mandril is pressed into the “ plate, and the levers and pressers are guided by cams in such “ manner as to form the sides of the plate over the mandril.”

“The plates previously to being bent over or round the mandril, are chamfered at the edges, so that they form an even “ surface after being brought together, and preparatory to being “ welded.”

[Printed, 8d. Drawings.]

A.D. 1856, December 16.—N° 2975.

AUSTIN, WILLIAM.—This invention relates to conjoining the ends of pipes intended to be connected together in one continuous length, for the conveyance of steam, water, and other fluids and substances, the object being the formation of a series of joints severally easy of dislocation, so that a disconnection may be made, and a pipe removed and replaced without having to derange or disturb the adjacent pipes with which it was connected.

To this end a half portion of both ends of each pipe is either removed, or in the process of casting, the moulds are prepared for forming at each end a short longitudinal prolongation, exactly *one half of the circumference*, so that when the ends of the two

pipes are brought together, the longitudinal edges of the semi-cylindrical prolongations come face to face and form a continuation of the cylinder or pipe; over each junction is slid a collar made in the form of a conical frustum, in order that it may slide over the packing material with which the junction is lapped. When desirable to remove a length of pipe, all that is necessary is to drive back the collar, remove the packing, and lift out the pipe.

[Printed, 8d. Drawing.]

A.D. 1856, December 29.—N<sup>o</sup> 3090.

SPEED, JOHN JAMES the younger, and BAILEY, JOHN AYLESWORTH.—This invention relates to the manufacture of seamless pipes from cast tubular ingots of metal, "elongated or "thinned out lengthwise" by three compression dies, the operating ends of which in conjunction form a circular orifice, through which the tube, as its size and diameter is gradually reduced by the pressure of the dies, is carried by an intermittent movement of the mandril whereon the ingot is placed, the mandril also being caused to rotate. The two lower dies are placed in beds inclining towards the axis of the mandril, and the vertical action of the upper die is directed to the same point, its motion being obtained from toggle-jointed levers actuated by the mechanism. The head of the mandril which projects through the dies is in form a plain cylinder, its size corresponding with the dies and the desired dimension of the bore of the tube, and the back part constituting its principal length is of the same diameter screw-threaded externally, carrying a traversing nut and ratchet wheel, the former advancing the ingot successively after each action of the dies, and the latter causing its rotation, so that by means of these combined movements of the mandril, all longitudinal ridges caused by the edges of the dies when they meet on the surface of the tube, are reduced or avoided.

[Printed, 10d. Drawings.]

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1857.

A.D. 1857, January 8.—N<sup>o</sup> 72.

RUSSELL, JOHN JAMES, and HOWELL, JOSEPH BENNETT.  
—The object of this invention is to improve the manufacture of



steel tubes applicable to the flues of steam boilers and other purposes. After the steel has been converted in the ordinary manner, it is rolled into sheets of the width, length, and thickness required, after the manner of rolling iron, and the edges are cut to the proper form or bevel required for forming when welded either a lap or a butt joint. The flat sheets thus prepared, after having their edges turned up so that they nearly or quite meet, are when heated to a welding heat closed by external pressure either by drawing through the dies or passing between grooved rollers, and are supported internally or not during the welding process by mandrils.

[Printed, 4d. No Drawings.]

A.D. 1857, January 22.—N° 195.

HICKMAN, GEORGE HADEN, and HICKMAN, ALFRED.—*(Provisional protection only.)*—This invention relates to the manufacture of the strip and hoop iron used in the making of wrought-iron tubes, and for other purposes. The inventors say:—"In place of rolling the iron to the widths desired, and also in place of cutting iron rolled into sheets by shears as heretofore practised, the iron is, according to our invention, rolled into a strip of the thickness or gauge desired, and is then passed through a pair of rotating cutters, whereby the edges are cut or sheared away, so that the strip or hoop is turned out perfectly smooth on the edge."

[Printed, 4d. No Drawings.]

A.D. 1857, January 27.—N° 241.

STEWART, DAVID YOOLOW.—This invention relates to the moulding process and manufacture of cast-iron pipes of the "faucet" class, and comprises the preparation of the cores, the placing of the core in the mould previous to casting, and a method of removing the core after the casting process. The invention has reference more or less to Mr. D. Y. Stewart's patented invention which bears date January 4, 1849, No. 12,402. The core bars are plain cylinders, coated with a layer of vegetable matter reduced to form by a shaping or sweeping edge. The pipes are cast in a vertical position, faucet end downwards, the core being suitably adjusted and lowered by appropriate tackle down the center of the upright mould. After the pipe is cast, the mould box containing the casting and core is placed in a horizontal



position, and the core is forced out by a suitable hydrostatic press. By this means (it is stated) superior castings are produced and the progress of the work facilitated.

"According to a prior patented invention by Mr. D. Y. Stewart, bearing date July 14, 1846, No. 11,296, the formation of moulds for casting pipes is effected by a vertical spindle, carrying at its lower end a screw blade-arrangement, which ascends within the mould box as the moulding sand is shaped into form beneath. Instead of using counter weights or other apparatus at the upper end of this moulding spindle, the present invention provides for the use of an adjustable frictional nut apparatus in connection with the top of the spindle for the purpose of securing increased efficiency in the moulding action. According to this new arrangement, the moulding screw spindle is cut with a screw thread, which is embraced by a pair of worm wheels set on parallel spindles geared together. The contiguous edges of these worm wheels form the nut or fixed threads for the screw on the spindle, and their spindles being provided with a suitable frictional break apparatus, the moulder can temper the rise of his screw-blade spindle to the greatest nicety, and he can thus modify the longitudinal traverse of the spindle either up or down in a most convenient and effective manner."

[Printed, 10d. Drawing.]

A.D. 1857, February 7.—N° 353.

JOHNSON, JOHN HENRY. — (*A communication from Messrs. Jackson Brothers, Petin, Gaudet and Company.*)—This invention relates to casting steel in chills which, for the purpose of producing a more perfect cohesion of the metallic particles and prevent flaws are, during the time the molten steel is running in, caused to revolve at a high velocity. The invention is applicable to the casting of solid steel wheels, steel tubes, and hollow cast steel axles for railway carriages.

"In casting railway or other solid wheels the chill, which is shaped internally to the exact form of the wheel, is secured by bolts and nuts to an end of a shaft which is made to revolve at the rate of from about five hundred to one thousand revolutions per minute. The molten steel is run into a central opening in the cover of the chill, and is instantly directed by the centrifugal force against the inner circumference of the chill, thus rendering that part of the wheel perfectly sound and

“homogeneous, and thus it is entirely free from flaws. When the chill is full, a mandril is caused to enter the central opening, and as the chill still continues to revolve it has the effect of smoothing or polishing the central opening in the wheel. The mandril is then withdrawn, and the revolutions of the chill having been stopped, the cover is removed and the complete cast-steel wheel taken out. This wheel may or may not, as found desirable, be subjected to the blows of a steam hammer between suitably-shaped dies.”

“The casting of steel tubes suitable for marine or locomotive boilers is effected in a similar manner to the above, the chill consisting of a tube into which the steel is run. When the metal is set, the tube is removed by opening the chill down the center, it being made in two parts for that purpose, and is held together during the running in of the metal by metal ferules or rings driven on to it. The steel tube so cast is then removed to the rolling mill and is drawn out to any desired extent. If intended for a hollow railway axle, it is reduced into shape by a steam hammer or other well-known contrivance.”

[Printed, 8d. Drawing.]

A.D. 1857, February 10.—N<sup>o</sup> 381.

OWRID, BENJAMIN WEBSTER.—(*Letters Patent void for want of Final Specification.*) The object of this invention is to improve the ordinary method of connecting and disconnecting pipes. It “consists in the employment of a ring or collar, the inner surface of which is conical, so as to act as a wedge, either with or without the application and use of a suitably formed filling (whether metallic or otherwise) for placing between the outer surfaces of the pipes and the inner surface of the ring or collar which is placed around the joint. This ring has its internal surface conically shaped, the filling having its external surface similarly formed, the ends of the pipes being brought together, and the ring or collar placed around the joint, the conical or wedged-shaped filling or packing is then driven between the ring and the pipes, and a perfect junction is effected. When the pipes are required for liquids, cement is used for the filling, and by driving off the ring the pipes may be disconnected with facility, but for most other purposes the packing may be formed of lead or other soft yielding or compressible

“metal or substance. When it is preferred to make the joint without the use of the annual wedge or other filling, I employ the above-named ring, having the internal surface tapered, and the pipes are so formed at the ends to be joined that they may be turned so as to taper from one end, the joint being near the centre of the taper; the internally tapered ring is then to be driven or wedged on to this external taper, and the junction of the pipes is effected and may be readily disunited again by driving off the annular wedge.”

[Printed, 4d. No Drawings.]

A.D. 1857, February 13.—N° 424.

RICHARDSON, WILLIAM.—This invention relates to a system of combining in tubular and other forms, iron or other metal with various materials, such as bricks, tiles, pottery, concrete, or wood, for structural purposes, comprising tubes and tunnels for main drains and sewers or conduits, which may be supported above ground for the passage of large bodies of water. In general the use of cast iron is contemplated for the purpose, but in some cases wrought iron or other metal either cast or wrought may be employed. The metal is cast in curved plates forming sectional segments of a tube or cylinder. For constructing a sewer 10 feet in diameter it is proposed that each segmental plate shall be cast 6 feet by 4 feet, and 1 and  $\frac{1}{8}$  inch in thickness, with flanges to project either internally or externally 3 inches wide and 1 and  $\frac{1}{2}$  inch thick; each flange to have corresponding bolt holes cast in to receive the bolts, the curve of each plate being the segment of a circle 10 ft. in diameter. The tube is formed by connecting these plates together longitudinally and laterally (breaking joint) by means of bolts and nuts, and if the tube is required to be of great strength, the upper and lower plates are to have strengthening ribs longitudinally cast upon them; they may also be cast with girder plates or flanges, and between the joints india-rubber or other suitable material is used as a packing that will make the joints water tight and yet permit the expansion of the metal consequent on change of temperature.

Inside the main tube is a lining tube, made by preference of glazed pottery; this tube is also made in segmental sections, which are of smaller diameter, so that an annular space is formed between the two tubes for the reception of sand, sawdust, char-

coal, or other non-conducting substance, which is firmly rammed in. Enamelled plates may be used in the construction of tubes.

The walls of buildings flat or curved may be constructed upon the same principle.

[Printed, 1s. Drawings.]

A.D. 1857, February 25.—N° 549.

FENTON, JAMES. — This invention, relating to a method of connecting the feed pipes of locomotive engines, is designed as a substitute for the ball-and-socket jointed pipes usually employed. The inventor says :—"I use a tube or connecting pipe made of  
 " any suitable metal or material, the ends of which are placed  
 " within larger tubes or sockets. Over the said connecting pipe  
 " and within the sockets I place a flexible or elastic ring, the  
 " cross section of which is circular, so that it may have a rolling  
 " motion when the pipe moves to and fro in the sockets, or the  
 " sockets upon the pipe. I also place flanges or collars either  
 " upon the pipe or sockets in order to regulate the length of  
 " motion of the ring ; a part of each end of the connecting pipe  
 " between the flanges or collars is coned, and the collar or  
 " flange adjoining the cone is curved, so that when an extra  
 " pressure is applied, either of steam or water, the ring rolls or  
 " slides, or partially rolls or partially slides off the parallel part  
 " of the pipe or sockets to or upon the aforesaid curved and  
 " conical part, thereby tightening the ring and effectually preventing leakage.

"The rolling motion of the ring gives it greater durability, as well as avoiding the excessive wear and tear caused by the friction of the sliding parts, as heretofore adopted."

[Printed, 1s. Drawings.]

A.D. 1857, February 26.—N° 571.

MACFARLANE, WALTER. — This invention, connected with the manufacture of cast-iron pipes, relates—

1st. To the system and apparatus employed for forming vertical moulds, the pipes in this case being "cast on end." The pattern forming both mould and core in green sand consists of a plain short cylinder, which is caused to revolve and gradually rise as the sand is filled into the cylindrical moulding box and rammed down, there being a central core bar fluted longitudinally and furnished with small mandrils, which leave holes in the



sand for the escape of the gases. When the pipe is required to have a socket or faucet piece, the pattern for it (in two halves) is introduced in the top of the moulding box after the cylindrical pattern piece has been withdrawn. Instead of using small mandrills to form vent passages for the gases, other plans are devised for the purpose.

2nd. Relates to moulding pipes and similar articles in a horizontal position in green sand, the core (also of green sand) being either made in a separate core box, or formed by the interior portion of the pattern, and having a cellular cavity extending throughout its length for the purpose of venting it.

According to another system of moulding pipes horizontally or nearly so, and forming both mould and core of green sand, the pattern is made in two halves, and serves the double purpose of shaping the mould and forming the core. Cellular cavities are formed in both mould and core for venting purposes, and the operation is effected without the use of nails or chaplets, but in some cases "thickness pegs" are employed.

Describes a mode of moulding bends, elbows, branches, and fittings. "The bend or elbow pattern is made of the exact shape of the intended elbow pipe, and it is in two halves, each moulding box having in it a separate and distinct pattern. The under half of each of the two elbows is placed upon a laying down board, and the drag part of the box is rammed up with sand, and then turned over in the usual way. The inside or core part is then rammed partially with sand, and upon this is laid a species of duplex core bar, one side for each elbow. The top halves of the boxes are then placed upon their corresponding under halves, filling up the inside or core with sand from the end. The top part of the box is then placed on and filled in with sand in the usual manner, parting the box and taking out the top part of the pattern. The box is then turned over, and the under half of the pattern is taken out, and the mould is ready for casting."

In some cases the gases which are confined are made to serve the purpose, after the casting operation, of breaking up the core.

[Printed, 2s. 2d. Drawings.]

A.D. 1857, . . . . . N<sup>o</sup> 571.\*

MACFARLANE, WALTER.—A "Disclaimer and Memorandum of Alteration" in respect to certain parts of the preceding

invention was filed by the above Walter Macfarlane at the Great Seal Patent Office on May 2, 1859. It relates to a modification of the system of horizontal moulding referred to and described in the original Specification, and consisted in making the inside of the pattern answer the purpose of forming the core. By this means it is stated "the expense of making separate core boxes is avoided, as well as the inconvenience arising from any inaccuracy in the core box and pattern itself."

A re-adjustment of the claims has also been made, these (formerly numbering eight) are now condensed to four, viz. :—

1st. "The simultaneous formation of the moulds and cores for casting pipes, or the surfaces for shaping and producing both the inside and outside surfaces of pipes, the said moulds and cores being formed in a vertical position for the purpose of casting pipes on end, and the general arrangement and construction of machinery or apparatus, either stationary or moveable, for forming the moulds and the cores, or both the inside and outside shaping surfaces of the pipes at one operation.

2nd. The system or mode of making the moulds and cores for cast-iron pipes with cellular cavities and longitudinal or other openings, for the purpose of venting the mould and core, and for facilitating the breaking up of the core or mould, and also for confining the steam and gaseous matters, which, by their expansive force, serve to partially break up the core and release the casting."

3rd. "The use and application of thickness pegs of one uniform thickness throughout, instead of nails or chaplets to the cores of pipe moulds, and of a bearing plate or 'core strap' for holding a 'thickness peg,' and by means of an adjustable screw or double incline binding stud in the moulding box acting upon the thickness peg, the core is kept in its proper position during the process of casting."

4th. "The system or mode of moulding and manufacturing bends, 'elbows,' 'branches,' 'heads,' and other pipe fittings, in which the pattern is made to form the mould and the core."

[Printed, 10d. No Drawings.]

A.D. 1857, March 2.—N<sup>o</sup> 604.

JONES, EDWIN FRANCIS.—In the specification of this invention, which relates primarily to a method of heating the hot blast for

furnaces employed in the manufacture of iron, there is also described a flexible expansion joint or coupling. The mode of heating the blast, consists in causing the air current to pass through a series of annular spaces formed in a number of tiers or sets of double pipes, each of which comprises a small pipe concentrically placed within one of larger dimensions. These double pipes are so disposed in an oven contiguous to the heating furnace, that the hot draught therefrom plays over them both externally and internally.

The expansion joint, or system of connection which is employed to permit of different rates of expansion between the inner and the outer pipes consists of a circular expansion plate or large washer, having a central hole large enough to admit the end of the internal pipe and slide along it to a shallow flange cast on the other end of the pipe, and against which the expansion plate is securely bolted. The end of the external pipe has cast upon it a projecting flange of unusual breadth, corresponding to the external diameter of the plate, and when the two pipes are adjusted one within the other, by means of bolts passed through holes made as close as possible to their peripheries, the flange of the pipe is bolted to the back of the plate, so that the latter is held near its external periphery by the flange of the large pipe, and near its internal periphery by the flange of the small pipe, and when any difference in the expansion of the two pipes takes place, it is compensated by the flexion of the plate.

[Printed, 10d. Drawing.]

A.D. 1857, March 5.—N° 645.

GREAVES, HUGH.—This invention relates to a mode and apparatus for securing the union or connection of pipes adapted to the conveyance of steam, gas, water, and other fluids; and also to the construction of pipes cast or combined with rails, adapted to the double purpose of conveying fluids and forming tramways; likewise to connecting the parts of solid or hollow columns.

The ends of two pipes when butted together are so shaped externally as to form a continuous cone, and over this cone is slipped and forced on, a coupling hoop of corresponding form. The joints thus secured may be made air or water tight by the use of dissolved salammoniac, red or white lead, or other suitable substance applied between the surfaces in contact. The parts of columns are united in the same manner.

The junction hoops are made of flat wrought iron, welded and brought to the required form by a rolling process, the hoop during the operation being supported on a mandril. In some cases the coupling hoops may be made of cast iron, having their internal surface chilled to fit the coniform ends of the pipes, which may also be chilled to ensure a tight fitting joint.

Rail and gutter pipes are united by fish or splicing plates, and cast-iron pipes may have the necessary parts cast upon them for securing thereto wrought-iron rails.

[Printed, 8d. Drawing.]

A.D. 1857, March 5.—N<sup>o</sup> 650.

THOMPSON, THOMAS JEFFERSON.—This invention relates to the construction of gasometers adapted as holders for the gas employed in lighting railway carriages, the object being to avoid as much as possible the use of a large body of water. It also relates to so constructing the couplings wherethrough the gas is conveyed from the tender and which connect the pipes leading from carriage to carriage, that the connection cannot be broken at any coupling without cutting or turning off the gas.

The cutting off apparatus is “permanently fixed upon each end of every carriage; and consists in a small branch pipe, which when the gas is turned on and the carriages coupled is kept in its proper position by means of a spring, but when any strain comes upon the aforesaid coupling pipe, from the carriages becoming detached, or from other causes, the strain upon the pipe will then draw the cut-off pipe out at right angles to the end of the carriage, and thus turn off the gas. The union joint upon the end of the pipe cannot be unscrewed without first turning off gas, as the plate upon which the cut-off pipe is screwed has two wings, which project round the union joint, thereby preventing any possibility of its being disengaged while the gas is turned on in that cut off pipe, thereby preventing escape and loss.”

The gas holder, rectangular in form, is fitted above the tank of the tender, and its sides as it becomes exhausted, dip or descend into a thin body of water contained in a narrow space formed between an inner and an outer casing. Counterbalance weights are dispensed with, and instead thereof, guides and spring catches are employed. There are suitable pipes for conveying the gas



for distribution to the carriages, the supplies being obtained at the stations.

[Printed, 1s. 2d. Drawings.]

A.D. 1857, March 28.—N° 871.

**RUSSELL, JOHN JAMES.**—This invention relates to the manufacture of tubes from sheet iron, steel, or cast steel, with compound butt and lap joints, a strip or bar of **V** or **T** or other angular shape in transverse section, being laid between the edges of the skelp and welded in. The arrangements of the heating furnace are also described and illustrated.

To secure a perfect welded seam or joint it is advisable to pass a scraper or cutting tool along the contiguous edges of the skelp, not only to clear away all cohesive dirt, but also to give the edges a form corresponding with the transverse section of the **V** or **T** strip or bar, or the edges of the skelp may have the necessary form imparted to them to receive the strip in the rolling process. In the case of steel tubes, a flux may be applied for facilitating the intimate union of the parts. For this purpose, calcined sandstone is preferred, or the powdered silicate obtained from the inside of steel converting or refining furnaces, but other fluxes may be used according to the nature of the material or the articles to be produced.

Tubes of large diameter made lap-jointed of either iron, steel, or cast steel, in one piece or in sections, are heated from a closed blast furnace, having an opening for the emission of flame which is driven out and plays upon the seam of the tube; when the latter is at a welding heat it is subjected to the process of either hammering or pressing, a mandril being employed internally to afford during the process the necessary support and resistance.

[Printed, 6d. Drawing.]

A.D. 1857, May 13.—N° 1347.

**ELEY, EDWARD.**—This invention relates to pipes adapted to the conveyance of hot water for heating purposes, the object being to increase the area of the heating surface and at the same time, not only lessen the internal space of such pipes, but give them an ornamental character such as would harmonize with the architectural design of the building in which they are disposed. To this end several designs which are described and

exhibited in transverse section, are set forth as specimens; these consist of, 1st. A pipe indented or fluted either longitudinally or spirally. 2nd. A pipe which is made flat and then bent into a trough-like form; this pipe is intended to hold water for evaporation externally, and to convey internally hot water for heating purposes. 3rd. A pipe which in transverse section has the form of a star with rounded points; this pipe contains a plain circular pipe, and the interspace between the two is the channel through which the heated water circulates; the inner pipe forms a passage for air, which is heated whilst passing through. 4th. Two circular pipes, one within the other, forming a double pipe plain on the outside; this pipe has also two channels, respectively, for the conveyance of water and air for heating purposes.

Various other ornamental forms may also be "employed with "more or less advantage," and fluted pipes may be used in the construction of steam boilers.

[Printed, 6d. Drawing.]

A.D. 1857, May 20.—N° 1429.

KEMP, EDWARD CURTIS.—(*A communication.*)—(*Provisional protection only.*)—This invention relating to unions adapted to connecting the ends of gas and other pipes and tubes, "consists "in forming one part of the coupling with a square or hexagonal "recess, and the other part with a projecting part to correspond, "which fits into the recess of the other, and whereby the one "part is readily and may be repeatedly adjusted in the same "position, and prevented turning round upon the other or altering its position while screwing on the cap. Instead of square "or hexagonal parts, parts of other forms may be used for the "same purpose; or projecting pins on the one part may be "received into holes in the other part with like effect."

[Printed, 4d. No Drawings.]

A.D. 1857, June 8.—N° 1603.

BROOKS, EDGAR.—This invention relates to the manufacture of gun barrels, and to other tubular articles requiring great strength. The process of making a gun barrel in accordance therewith, is described as follows:—

"I take a rod of iron, and coil in a helical direction upon a "cylindrical rod or mandril, the coils of the helix being brought

“ as close as possible into contact. The coil is raised to a welding heat, and is supported internally by a mandril. The said coil is then submitted to the compressing or percussive action of a pair of dies, each of which is nearly a hollow semi-cylinder. The coil is compressed or hammered between the said dies until it is welded into a compact hollow cylinder. In order to secure the lateral welding of the coils together, the interior of each die is provided with a series of projecting ribs, having such a figure, that, when the two dies are brought together, they form a hollow cylinder, on the interior of which is a helical coil of the same pitch as the coil to be welded. The heated coil is so placed between the dies, that the projecting coil in the said dies presses when the dies close either upon the middle or edges of each coil of the iron helix. By pressure upon the middle of the coils, the said coils are made to spread laterally, and press against each with great force. By pressure upon the edges of the coils, nearly the same effect is produced. A firm welding of the coils together is thus effected. When removed from the welding machine described, the barrel has a projecting helix on its exterior, in the middle of which helix the weld is situated when the pressure has been applied to the middle of the coils.”

“ In order to give a cylindrical figure to the exterior of the barrel, it is operated upon by a pair of dies or swages, or by a series of hammers and a V-shaped die. During the action of the machines . . . the barrel is turned round, so as to act upon all parts alike; or the barrel may be made cylindrical by a pair of ordinary rolls having semi-cylindrical grooves; or any other figure may be given to it by rolling or otherwise.”

[Printed, *8d.* Drawing.]

A.D. 1857, June 11.—N° 1641.

CLARK, JOSIAH LATIMER.—This invention relates to apparatus for conveying letters or parcels between places by the pressure of air and vacuum, the object being so to conjoin or connect the tubes in order to form a continuous line, that no obstruction is formed in the internal passage. This is effected by making the ends of the pipes to butt together, and by drawing over the butt joint a vulcanized india-rubber tube or sleeve; this sleeve in turn is covered by a metallic strap made in halves each with projecting



lugs for screw bolts, whereby when drawn together, they are caused to impinge upon the india-rubber and make an air-tight joint.

The other parts of this invention relate to the construction and mode of working the junctions, the method of propulsion by alternate atmospheric pressure in one direction and by vacuum in the opposite direction, one pumping engine being all that is required in connection with the reservoirs, which may resemble ordinary gasometers. The general manner of preferably working the system is described, including the use of valves and mode of working them at intervals along the line to obviate the retarding effect in the tube by the friction of the air; the mode of working pneumatic telegraphs, and the general arrangements and management.

[Printed, 1s. Drawings.]

A.D. 1857, June 18.—N<sup>o</sup> 1702.

RALPH, THOMAS LOWELL, and RALPH, THOMAS LOWELL, the younger.—This invention relates to the manufacture of metallic tubes from cylindrical ingots, and to the construction of the drawing out or rolling apparatus. As stated by the inventors, “we place the billet or hollow metallic cylinder which is to be made into a tube upon a mandril having a prismatic figure, the said mandril being in transverse section of a lozenge shape, the said lozenge being square or very nearly square. The four angles of the lozenge are replaced by planes equally inclined to the adjacent sides of the lozenge. The hollow cylinder or billet placed upon the said mandril is passed between a pair of rolls having grooves, which, when opposed to each other, have in section nearly the figure of the before-mentioned mandril; the said grooves are so formed that the longer diagonal of the lozenge-shaped space enclosed by them is situated horizontally. The rolls are each provided with a series of the said grooves, of progressively diminishing size, through which the partially formed tube is passed in succession. We prefer to employ a series of three rolls, the axes of which are parallel and situated in a vertical plane, the middle roll forming a pair both with the upper and lower roll. The partially formed tube can, by the use of three rolls, be passed in one direction between one pair and back again through the other. By the method described



" the tube can be reduced in diameter and elongated, and readily  
" removed from its mandril. The tube may be made cylindrical  
" by the use of rolls with cylindrical grooves, and finished at the  
" draw bench."

[Printed, 8d. Drawing.]

A.D. 1857, June 24.—N° 1768.

SANDERSON, CHARLES.—This invention relates to the manufacture of railway rails, girders, and other articles capable of resisting pressure, concussion or strain.

These rails, girders, and articles are made either hollow or solid, of iron and steel combined, or of steel alone hardened and tempered for the purpose of increasing their strength and rigidity.

Rails and girders of iron, have a thick crust of their surface steelified by the usual process of conversion.

Another mode of combining the steel and iron, consists in taking a bloom of iron at a white heat and adding thereto cast steel in a fluid state, the combined metals being afterwards rolled into bars or other forms, as described in the specification of a former patent granted to this inventor, and bearing date November 4, 1845, No. 10,921; the invention here referred to does not belong to the present series of Abridgments.

In all cases the subsequent hardening and tempering of the combined metals must be resorted to, otherwise much of the advantage to be derived from the use of steel alone or combined with iron will be lost.

Hollow or tubular rails or other articles may be made from blooms of combined iron and steel rolled to the desired form and substance, and sheets of iron and steel combined and rolled, and afterwards subjected to the process of hardening and tempering, may be employed in the construction of tubular bridges, ship-building and boiler making.

[Printed, 10d. Drawing.]

A.D. 1857, June 24.—N° 1769.

MUNTZ, GEORGE HENRI MARC.—(*Provisional protection only.*)—This invention relating to the manufacture of tubes from sheet metal, refers to the forming and closing the longitudinal joints and seams, and to the construction of the furnaces employed to heat the edges of the seam previous to welding.

The closing seams of small or moderate sized tubes of sheet metal are made by so bringing together the edges of the plate, which is first bent into a cylindrical form, as to leave a wedge-shaped space between them, wherein is inserted or laid a metal strip. The parts are then heated to a welding heat, and the seam of the tube is closed and made perfect by passing it between suitable rollers. Steel tubes are closed in the same manner, a suitable flux for facilitating the union of the edges of the steel plate and intermediate steel strip being employed in the welding operation. The above process is preferably used in the manufacture of hollow axles for locomotive and other purposes.

Tubes of large diameter have their seams closed with a lap joint.

The heating furnace is constructed with a long narrow opening along its side, in which the contiguous edges of the metal which form the lap joint or seam are presented to the heat, a blast directing the flame towards the opening upon the metal. The lap joints are, when at a welding heat, closed by either rolling or hammering, a suitable mandril being used as an internal support.

[Printed, 4d. No Drawings.]

A.D. 1857, July 8.—N° 1900.

BAHN, LOUIS ALBERT.—(*Provisional protection only*).—"This invention consists in the manufacture and application to the purposes of sheathing for ships, boiler plates, tubes, and other similar purposes, of metallic alloys, composed of copper, tin, and spelter; the articles manufactured from these alloys being afterwards galvanized."

[Printed, 4d. No Drawings.]

A.D. 1857, July 17.—N° 1982.

BARWELL, WILLIAM.—(*Provisional protection only*).—This invention relates to casting metals generally, and especially to the casting of hollow cylinders of copper, and alloys of copper and other metals. It is described in its application to the casting of such hollow cylinders of copper or brass as are used for the manufacture of tubes and for printing rollers. "I make a mould of a suitable form for casting a cylinder, and I support in the axis of the mould a core or cylinder, and between the interior of the said mould and the said core the molten metal is poured in

" the usual way. I make the said mould of coarse sand mixed  
" with horse dung, or chopped straw or hay, or other suitable  
" matter, and I make the core of a cylinder of the same materials,  
" in the interior of which I prefer inserting a metallic rod or  
" cylinder for the purpose of strengthening the same. In order  
" to make the mould and core more porous, I pick small holes  
" therein. When the molten metal is poured in a mould pre-  
" pared as described, the air escapes freely through the pores and  
" perforations in the mould and core, and the casting produced is  
" sounder than castings obtained by the ordinary method of  
" casting. The casting is not removed from the mould until  
" it has perfectly cooled."

[Printed, 4d. No Drawings.]

A.D. 1857, July 20.—Nº 2000.

BROOMAN, RICHARD ARCHIBALD. — (*A communication.*) —  
(*Provisional protection only.*) — This invention, relating to appa-  
ratus adapted to the manufacture of pipes and tubes, is chiefly  
designed for making copper tubes. These tubes are formed out  
of cast or otherwise cylindrically formed ingots by a process of  
rolling. The ingot is placed upon a mandril whence it is stripped  
off by the action of rollers as it passes between them. "The  
" rollers are grooved on their edges with a groove which is a seg-  
" ment of a circle, so that when four (or any other convenient  
" number) are brought properly together a round hole will be  
" formed where the rolls mitre together. These rollers are geared  
" together, so as to be compelled to revolve alike, and they have  
" also cross cuts made in the grooves, which cuts it is preferred  
" shall be made in a diagonal direction, or similar to a female  
" screw. The mandril is held at one end by a swivel pin fixed in  
" a strong frame, and so that the other end shall, when in place,  
" only extend into and terminate in the hole formed by the  
" grooves where the peripheries of the rolls join. When the ingot  
" or casting is to be slipped on this mandrel, that end of it which  
" is between the rolls is to be withdrawn and turned aside suffi-  
" ciently to allow of the ingot being slipped on, and when re-  
" placed the end of the ingot will be caught by the revolving  
" rollers, and the whole drawn through the cross cuts, forming  
" grippers as it were to prevent slipping, and thus stripping the  
" metal from the mandril, which forms the base for the crushing  
" action of the rollers. A second set of rollers may be placed

“ immediately after the first set, and thus a further reduction and  
“ extension of the ingot will be effected upon that single heat,  
“ the metal being annealed for further working in the usual way,  
“ until the whole is reduced to the degree of thinness required  
“ for any given tube, the tube being passed from one set of rollers  
“ to another set having its central hole and mandrel smaller until  
“ that object is attained.”

[Printed, 4d. No Drawing.]

A.D. 1857, August 19.—N° 2204.

POTTS, FERDINAND.—This invention relates to cutting out and preparing, bending and forming, finishing\* and polishing tubes made of sheet metal.

1st. Apparatus for preparing or cutting out the strips or bands of metal suitable for either parallel or taper tubes, the strips being formed tapering or otherwise in accordance therewith. This apparatus operates by means of a revolving steel disc, having a cutting edge, which traverses along and engages with the cutting edge of a steel edged bed, whereon the sheet of metal is adjusted, and overhanging so much of its width as is required to be cut off to form a strip.

2nd. Shaping or forming taper tubes, whether required to be subsequently soldered or otherwise, is effected by first passing the strip longitudinally between grooved rollers to give it a trough-like form, and next, in order to make it circular, placing it under the operation of a tilt hammer.

Thence it is taken and forced into a tapering hole or die, and a tapering mandril is driven into it in order to give it a perfect and regular form, the binding up with wire and soldering being subsequently performed in the usual way.

3rd. Small parallel tubes suitable for umbrella sticks are formed by drawing a thin metal band through a draw plate, after it has passed between grooved rollers.

4th. The finishing and polishing operation is effected by lapping or passing a band of list or other suitable material round the tube, to which band a reciprocating movement is imparted. Oil and rotten-stone or other suitable material is used in the operation, and as the band is drawn backwards and forwards the friction thereof on the surface of the tube imparts to it the necessary polish.

[Printed, 1s. 4d. Drawings.]



A.D. 1857, September 29.—N° 2503.

**PEARCE, JOHN CHARLES.**—This invention relates to the manufacture of the plates used in the process of hot pressing, to the pipes employed for conveying the heating and cooling media, and to a mode of suspending or retaining the plates in position after the press has been discharged, it consists in :—

1st. "Forming such press plates of two sheets of wrought iron or steel, with grooves or channels formed in one or both sheets, so that when the sheets are rivetted, welded, or otherwise fixed together, steam or other heating media, and water or other cooling media, may be circulated through them. Also in forming the grooves or channels in the sheets by means of revolving cutters, or by planing, turning, or other suitable cutting process. Also in forming the grooves or channels, by placing between a pair of sheets while they are red hot, a bent rod or frame of any suitable material (by preference wrought iron or steel) and then passing them between a pair of rolls, or submitting them to the action of a steam hammer or other suitable pressure, so as to impress the intervening rod or frame into the surfaces of the sheets. Also in forming the grooves or channels in the sheets by the ordinary process or by stamping, for which purpose one of the rolls or stamping tools is provided with a series of ribs or projections suitable for the purpose."

2nd. "The construction of the pipes or tubes employed to convey heating and cooling media to and from press plates, with folding joints or a combination of folding and sliding joints furnished with screw collars and stuffing boxes to reduce friction and prevent the escape of the heating and cooling media, and at the same time allow the pipes to accommodate themselves to the necessary movement of the press plates, without obstructing the internal passages of the pipes."

3rd. "Supporting or suspending press plates at the required distances asunder when they are relieved from the pressure of the press, by means of bolts, hooks, or loops, provided with adjustable or fixed collars or shoulders, and fitted loosely into suitable holes, slots or projections near the edges of the plates, so as to admit of the required movement of such plates."

[Printed, 10d. Drawing.]

A.D. 1857, October 6.—N° 2562.

STONEHAM, JAMES, and LEES, JOHN PIPER.—This invention relates to a junction union devised for connecting pipes. The inventors say :—" In order to join and also to cover the  
 " junction of the ends of the pipes to be connected, we employ  
 " a nut or union, tapped or screwed about one half of its length,  
 " and slightly conical through the other half or portion, the said  
 " nut being made of a metal or material harder than the pipes to  
 " be jointed or connected. The end of one of the pipes is placed  
 " in the nut or union, and forced or swelled out to fit the conical  
 " part, and the end of the other pipe is forced or swelled out by  
 " a parallel tool to the size required to form the thread, and by  
 " screwing the nut on the end of the said pipe a corresponding  
 " thread is formed. We place a washer between the ends of the  
 " pipes and draw them firmly together; the said washer may be  
 " made of wood, leather, gutta percha, caoutchouc, a compound  
 " of scaleboard and cloth, or other suitable material. By em-  
 " ploying the aforesaid nuts or unions, pipes made of lead or  
 " other soft material may be very effectively jointed or connected  
 " by unskilled persons, as the use of solder is not required."

[Printed, *ed.* Drawing.]

A.D. 1857, October 17.—N° 2660.

BROOMAN, RICHARD ARCHIBALD.—(*A communication from P. J. Guyet.*)—This invention consists of two methods of forming the joints or connection between pipes for conveying water, gas, or other fluid.

1st. " One of the pipes which is to be connected is formed with  
 " an enlarged end, terminated by a recessed flange, into the recess  
 " of which a ring of vulcanized india-rubber is placed, and against  
 " this ring a circular plate is tightly screwed to the flange. The  
 " second of the two pipes to be connected is then forced through  
 " the ring, which is of such an internal diameter as to admit the  
 " said pipe and grasp it tightly, forming with it a fluid tight  
 " joint. If the two pipes thus connected are to be subjected to  
 " longitudinal action, only the circular plate may be plain, but if  
 " they are to be subjected to transverse strains, this plate may be  
 " formed with a funnel-shaped flange, spreading outward from  
 " the packing ring."

2nd. According to this "arrangement, the enlargement of the  
 " end of one of the pipes may be dispensed with, and a boxed

“ flange formed on the pipe, into the recess of which flange a ring  
“ of vulcanized india-rubber is forced, and is there held by the  
“ boxed sides of the recess. The end of the second of the two  
“ pipes to be connected has a small circular shoulder screwed upon  
“ it, and a loose circular plate, which comes against this shoulder,  
“ is placed around it. Between this plate and the flange of the  
“ first pipe a ring of india-rubber with convex sides is placed, and  
“ the plate and flange are then screwed tightly together. If the  
“ hole in the loose plate is made to taper, the two pipes which  
“ are connected as before described, will be capable of moving  
“ more or less at an angle to each other, without opening the  
“ joint. The hole of the plate may be made cylindrical if this  
“ provision is unnecessary.”

[Printed, 8d. Drawing.]

A.D. 1857, November 10.—No 2336.

DEVON, WILLIAM.—This is an invention of a self-acting flushing apparatus adapted to water-closets, and of a mode of connecting them to the main drains, which mode is also applicable to the junction of gas and water pipes generally.

Two modifications of flushing apparatus are described, one being self-acting, and the other has no valve, the chain not requiring to be retained after being pulled.

Adjoining and disconnecting water and gas pipes to their mains without cutting in case of stoppage or discontinuing the supply. This is effected by means of a nut with a neck which is screw-threaded externally to the shoulder, and internally completely through, respectively with right and left handed threads, so that at the same time that the neck of the nut is being screwed into the main pipe, it receives internally the end of the branch or junction.

Uniting brass or lead pipes without solder. The extreme end of each pipe is enlarged to receive a ring, which is bevelled on each side to fit into them, their ends abutting against a central annular bead with which the ring is furnished. On each pipe bevelled at the end to fit outside the enlargement, there is a sliding collar; on one collar there is a shoulder, and in the other screw-threads to receive an annular nut which screws on over the joint, and by means of the shoulder on one collar, draws the two collars, towards each other, and forces their bevelled ends against the inclines and annular bead of the ring.

[Printed, 10d. Drawing.]

A.D. 1857, November 10.—N° 2840.

**PARKES, ALEXANDER.**—This invention relates to the manufacture of tubes and cylinders of copper and copper alloys.

“When using ingots or masses cast hollow, in place of casting the same in close moulds, as heretofore, they are cast in like manner to that practised when casting ingots, that is, in open moulds, so that the metal poured into the mould is uncovered on its upper surface. The mould is preferred to be rectangular, and of such depth and length as to produce the length and thickness of ingot or mass desired. The ends of the moulds are made with ledges or projections or otherwise suitable for supporting a core by its two ends, in such a position that when the melted metal is poured into the mould, the metal may, when the mould is filled to the desired extent, be as thick above as below the core. Or in place of casting ingots or masses hollow, I cast them solid; I then drill a hole through each, and make a saw cut through the mass or ingot. Such hollow ingots or masses are then to be rolled out or extended, and opened as heretofore. . . . The making of cylinders and tubes . . . is greatly improved by employing reducing alkaline fluxes when melting copper, or copper and its alloys, preparatory to casting the same into hollow ingots or masses.”

When using sheet copper for making cylinders or tubes for printers, I employ silver or silver solder for joining the edges. In place of casting ingots or masses hollow, I in some cases cast the mass of copper or alloy of copper solid, and then, when at a high temperature and inclosed in a suitable die, I punch out the central portion, so as to produce the requisite hollow mass of copper. In order to extend hollow masses or ingots of copper or alloys of copper, in place of using the ordinary draw plates or dies, I use dies or plates with an inclined screw thread on the interior, and when drawing or passing a tube or cylinder through such die or draw plate the plate is caused to revolve.

[Printed, 4d. No Drawings.]

A.D. 1857, November 23.—N° 2930.

**McFARLANE, WALTER.**—The object of this invention, which relates to the manufacture of cast-iron pipes and other cylindrical articles, and is supplementary to a prior patented invention, bear-



ing date February 26, 1857, No. 571, consists in part in the mode of forming the moulds and cores for the faucet part of pipes, by the aid of what are termed "template knife sleeker" tools, which answer the triple purpose of a "moulding knife" for removing superfluous sand, a "template," for working the sand into the required form; and a "sleeker," for imparting to the sand a smooth and even surface, the plain cylindrical part of the pipe being made (as described of the said former invention) by means of a pattern, which forms the mould and the core simultaneously.

The moulding of square, triangular, or other transverse sectional form of pipe horizontally, is effected by the use of patterns which part longitudinally in two or more pieces, and form the mould for the outside and also the core.

Describes a mode of facilitating the making of cores for articles of a circular or other shape.

Mechanical arrangements of the "thickness pegs" in the core and outside mould for keeping the core in its required or central position, and maintaining it against the action of the molten metal, when the latter is poured in.

The formation and use of core-bars for casting bends, angles, or other irregular shaped pipes and fittings.

Making "gates" in moulds for pipes and similar castings. "The gate is of the usual oblong wedge shape, but the gate pattern is fitted on its sharp edge with one or more projecting pegs or other guides, corresponding holes being made in that part of the pattern of the article to be cast which is adjacent to the gate, into which holes the sand pegs enter, and thus the gate is put in its proper place when the upper half of the mould is being rammed up."

[Printed, 1s. 2d. Drawings.]

A.D. 1857, November 23.—N<sup>o</sup> 2934.

HULETT, DAVID.—This invention consists in making cocks, taps, and valves, and joints for pipes and tubes or certain portions of them, such as the barrel, plug, shank, and handle, of malleable cast iron, either uncoated or coated with tin or other metallic substance or galvanized to resist oxidation, and capable of being united by solder, the iron being used as a cheap and durable substitute for brass, which metal is generally employed in the manufacture of such articles, which when made simply of cast iron have not heretofore been found to answer on account of their

brittleness, which objection is removed by the process of annealing and rendering them malleable.

[Printed, 4d. No Drawings.]

A.D. 1857, November 27.—N° 2959.

ELCOCK, WILLIAM, and BENTLEY, SAMUEL.—This invention relates to the manufacture from sheet metal, of wrought-iron elbows adapted to connect and change the direction of wrought-iron pipes; also to the tools employed in the process.

1st. Instead of making the elbow in two parts mitered together at the corner and relatively forming a right angle, which the inventors say impedes the flow of fluids, they, according to this invention, give to their elbows the form of a segmental curve representing  $90^\circ$  of a circle, and the ends being screw-threaded internally will receive and form a junction between the ends of two pipes screw-threaded externally, and placed relatively at right angles.

2nd. Relates to the tools and appliances required; these consist of a shaping tool or die for forming the outer curved half of the elbow, another tool or die for the inner curved half, and suitably bent mandril pegs, which are used internally to afford support and assist in effecting the welding and finishing process whilst the metal, previously heated to a welding heat, is in the dies, the preparatory process consisting in so shaping the metal plate, that it may be first brought into the rough form by turning up and bending over the corners, which are welded together previous to the final welding and finishing process by the aid of the dies and mandril pegs.

[Printed, 8d. Drawings.]

A.D. 1857, December 15.—N° 3085.

EVERITT, GEORGE ALLEN.—This invention relating to the manufacture of tubes or cylinders of copper, or of copper alloyed, refers to:—

1st. The casting of such articles under pressure in moulds somewhat larger transversely than the intended size of the casting, suitable cores being employed to form the internal cavity or bore. The inventor says, "I leave between the edges of the several parts of the mould spaces or grooves to be filled with sand or other compressible material, which will act as a cushion in

"preventing immediate contact of the edges of the mould. Directly the tube or cylinder has been cast, I apply pressure by hydraulic or any other suitable means to the outside of the mould, closing its parts together; the sand is thus forced out and the sectional area of the mould being thereby reduced, great compression of the moulten metal takes place, and a sound cylinder is produced. The cushions or fillets of sand may, if requisite, be pierced with small apertures to enable the air to escape more freely."

2nd. The alloyed copper employed in the manufacture of tubes and cylinders for printing rollers and similar purposes consists, of "about eight parts of copper to one part of good yellow brass, and by its employment I am enabled to produce a tube or cylinder of the color of copper, and free from the flaws or air holes to which tubes of pure copper are liable. The tube or cylinder thus cast is afterwards drawn down as a solid or unbrazed tube, and becomes a finished tube for employment as a printing roller or for other purposes of a solid drawn tube."

3rd. Relates to the cleansing and preparing such cast tubes prior to the subsequent drawing processes, for which purpose they are immersed in a solution of soft soap and water previous to each pass through the dies.

[Printed, 4d. No Drawings.]

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1858.

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A.D. 1858, January 1,—N° 5.

PARKES, ALEXANDER, and PARKES, HENRY.—The object of this invention is to combine with copper or copper alloy such a quantity either of phosphorous or metal of manganese, as will admit of the compound being rolled or worked either in a hot or cold state, into rods, tubes, wire, &c.

"In the Specification of a Patent granted to us, and dated the 2nd day of December 1857, we have described the use of phosphorous in producing compound metals when copper, or copper and alloys with zinc, are manufactured. Now, our present improvements consist in applying such compound

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“metals when drawing wire and tubes, and also when rolling or forming nail metal and rods. For the purpose of drawing into tubes or wire, we prefer that the proportion of phosphorous should be somewhat less than what was described in our said former Specification, but this is not essential, as tubes and wire may be drawn from such compound metals when using the same or even a larger proportion than what is recommended by us as being the best for sheathing metal, whether of copper and phosphorous, or copper and zinc with phosphorous.”

The compound metal, whether containing phosphorous or manganese is cast into ingots, which are afterwards manufactured into tubes or wire by any of the processes usually employed for that purpose.

[Printed, 4d. No Drawings.]

A.D. 1858, January 13.—N<sup>o</sup> 52.

MUIR, GEORGE WALKER.—This invention relates to the arrangement of apparatus for warming and ventilating by means of air currents passing through double shafts, or one shaft within another respectively for the influxion and refluxion of the air. It also relates to the manufacture of pipes, through which hot water for warming purposes is made to circulate. These pipes are made with longitudinal flanges; they are disposed on the top of the fresh-air drain, and they support the tiles which cover them. The flanges as well as the tiles are perforated with suitable openings wherethrough the air passes from the drain into the apartment or place which requires to be warmed.

The arrangements for ventilating will be found more particularly described in the vol. of Abridgments specially devoted to that class of invention.

[Printed, 10d. Drawing.]

A.D. 1858, January 18.—N<sup>o</sup> 80.

BROOMAN, RICHARD ARCHIBALD.—(*A communication.*)—This invention is designed chiefly for making copper tubes, and comprises a machine constructed to form the tube out of a heated cast cylindrical ingot, which by degrees is stripped from a fixed mandril by means of four disc rollers, as it passes between them. *The rollers are grooved or segmentally concave on their peripheries, and they are mounted on axes relatively so disposed in*



suitable bearings that the central plane of each disc intersects one common center, so that there a round hole or die is formed by the mitering or meeting together of the four rollers, which are all caused to revolve at one uniform speed by suitable gearing, their hollow peripheries being diagonally cut or serrated, in order the better to grip or drag the ingot off the mandril without slipping. "The mandrel is held at one end by a stop fixed in a strong frame, and so that the other end shall, when in place, only extend into and terminate in the hole formed by the grooves where the peripheries of the rolls join. The ingot or casting is to be slipped on this mandrel, and when it comes at length into place, the inner end of the said ingot will be caught by the revolving rollers, and the whole drawn through, the cross cuts forming grippers, as it were, to prevent slipping, and thus stripping the metal from the mandrel which forms the base for the crushing action of the rollers. A second set of rollers may be placed immediately after the first set, and thus a further reduction and extension of the ingot will be effected upon the single heat. The metal will require to be annealed for further working in the usual way until the whole is reduced to the degree of thinness required for any given tube, the tube being passed from one set of rollers to another set, having its central hole and mandrel smaller until that object is attained. It may be finished in a dead die if necessary."

[Printed, 8d. Drawing.]

A.D. 1858, January 20.—N° 102.

RUSSELL, JOHN JAMES.—The object of this invention is to improve the apparatus employed in the manufacture of welded tubes. To this end a series of dies is "carried by an axis in such manner that as soon as one of the dies has been used it is caused by a partial rotation of the axis to descend into and be immersed in a trough of water below, whilst at the same time another die comes into position to have a tube drawn through it; and it is preferred that each die should consist of two parts, one of which when a die comes into position to have a tube drawn through it is closed up to the other part, and retained secure by means of a lever and suitable catch. The means of opening and closing the parts of dies may be varied. It is preferred that the axis should carry four dies in

“ frames at right angles to each other, but this may be varied.  
“ In order to straighten tubes they are placed on a horizontal  
“ table, and are rolled thereon by a reciprocating plate, which is  
“ moved to and fro above the table parallel thereto, and at a  
“ short distance therefrom. When there is no tube between the  
“ reciprocating plate and the table, motion is communicated to  
“ the reciprocating plate in such manner that on coming to the  
“ end of its motion it assumes an inclined position in respect to  
“ the upper surface of the table, so that a tube may readily be  
“ introduced between the table and reciprocating plate.”

[Printed, 1s. Drawings.]

A.D. 1858, January 28.—N° 156.

JOHNSON, JOHN HENRY. — (*A communication from Charles Felix Sebille.*)—This invention, relating to the manufacture of soft metal piping, consists in applying internally to such pipes a coating or lining of tin during the process of manufacture. The pipe is produced by forcing the metal continuously through a die in the ordinary manner, but in order to effect the internal coating or lining of such piping, the internal fixed mandril must be of peculiar construction.

“ This mandril, if the pipe is of a very small diameter, may be  
“ made solid, but when larger pipes are to be tinned it is made  
“ hollow, so as to form a cup, the bottom of which is perforated  
“ laterally, so as to communicate with the exterior of the man-  
“ dril and the internal surface of the pipe. The mandril is fixed  
“ to a cross piece inside the cylinder of the press and immediately  
“ beneath the die or draw plate against which it bears. The  
“ middle portion of the mandril is made of smaller diameter than  
“ the top and bottom of the same, so that an annular space will  
“ be left between the sides of the mandril at that part and the  
“ interior of the pipe, the upper portion of the mandril being in  
“ the form of a projecting shoulder or collar, which fills the  
“ interior of the pipe. So soon as a short length of the pipe has  
“ been pressed through the die or draw plate, a quantity of  
“ melted tin previously prepared for tinning is poured therein,  
“ the amount being regulated according to the size and length  
“ of piping to be tinned. As the pipe now exudes from the die  
“ or draw plate, the melted tin contained therein and in the  
“ hollow of the mandril passes out through the perforations at  
“ the bottom of the mandril and fills the annular space between

“ the pipe and the middle portion of the mandril, thereby depositing a coating on the inside of the pipe as fast as it comes from the die or draw plate. This coating is well smoothed off by passing over the enlarged collar at the head of the mandril, which also acts as a soldering iron by compelling the tin to adhere to the interior of the pipe. When still larger tin pipes are to be produced, the mandril may be continued through into the cylinder, and secured to the ram or head of the press so as to move with it, thereby reducing the friction of the metal against its sides.”

[Printed, 10d. Drawing.]

A.D. 1858, February 20.—N° 334.

GREENE, WILLIAM, and GREENE, MATHEW CHARLES.—(*Provisional protection only.*)—This invention of a mode of adjoining soft metal pipes, is designed as a substitute for soldering together lead pipes, or for use in uniting soft metal gas pipes, in lieu of the ordinary screw coupling. The inventors state “ we throw out a flange on each of the ends of pipe to be joined, that is to say, the flanges are hammered or pressed out, or otherwise formed from the solid metal of the pipes. The two flanges thus formed are brought together, and a part of a screw coupling placed on each (the one male and the other female); the female receives the two flanges and screws on to the male, thereby binding the two flanges, and joining the two parts of pipe firmly together. The two screwed parts are both placed loose on the pipes, and are both furnished with suitable parts for the application of wrenches; or other means of gripping them may be provided.”

[Printed, 4d. No Drawings.]

A.D. 1858, February 27.—N° 394.

GILBEE, WILLIAM ARMAND.—(*A communication.*)—This is an invention adapted to water, steam, and gas pipes, of a union joint, which is intended to supersede the ordinary screw union. Upon the end surface of the flange of one pipe are cast four hooked lugs projecting endwise, and cast upon the end of the pipe wherewith the union is to be made, is a plain flange, close to the back of which on the end of the pipe, is fitted a loose collar. This collar, which is in two halves fixed together by small bolts and is free to revolve, has cast upon it four projecting segmental inclines, which



act as wedges and engage under the hooked ends of the lugs on the flange of the other pipe, and by turning the collar somewhat less than a quarter of a revolution, the end surfaces of the flanges of the two pipes are drawn into close contact, there being an annular groove sunk in the face of one flange to receive a packing ring of india-rubber or other suitable material.

Describes a modification wherein, instead of using the groove and india-rubber packing, an annular conical projection on the face of one flange, is turned to fit accurately into the extreme end of the other pipe, which is suitably enlarged to receive it.

[Printed, 10*d*. Drawing.]

A.D. 1858, March 13.—N° 513.

WALKER, SAMUEL.—This invention relates to the manufacture of tubes of copper or alloy of copper. The process is described as follows:—"I take a skelp or piece of sheet copper or alloy of copper, and having turned-up one end thereof place thereon a mandril. I pass the turned-up end of the skelp, together with the end of the mandril, through a lapping hole or turning-up hole, such as is commonly employed in making tubes at a draw bench. The said lapping hole or turning-up hole is fixed in front of a pair of rolls, having grooves of the size of the tube to be made. The end of the skelp and mandril being seized by the rolls, are drawn through the lapping or turning-up hole, by which the skelp is lapped or bent into a tubular form upon the mandril, the form of the partially made tube and lap joint being perfected by the action of the rolls, through which the tube passes after leaving the said lapping hole or turning-up hole. The pressure of the said rolls bevils the edges of the metal or skelp, and facilitates the subsequent brazing."

"The soldering of the joint of tubes made according to my invention may be effected in the ordinary way by means of hard solder, but I prefer to employ a solder composed of sixteen parts by weight of copper, sixteen parts of zinc, one and a half parts of bismuth, and two parts of lead, or thereabout."

[Printed, 6*d*. Drawing.]

A.D. 1858, March 23.—N° 602.

STOCKER, ALEXANDER SOUTHWOOD.—(*Provisional protection only.*)—According to this invention, whereby (it is stated) strength



combined with lightness is obtained in the manufacture of railway axles and tubes, it is proposed to make such articles by laminating tubes, that is, inserting a number of tubes graduating in size, one within another from the largest to the smallest, so as to form one main tube; or the same result is obtained by coiling or rolling round a mandril one or two metal plates, respectively iron and steel, so that when the coiled tube has been heated and welded it will consist of alternate layers of steel and iron, the length and diameter of the coiled tube thus produced being determined by the size respectively of the mandril and plates.

Two short tubes to form the end journals are produced in the same manner, one end of each being jumped or drifted up to form a solid end. These journal tubes are, when turned true in a lathe externally, partly inserted into the ends of the main tube, which is heated to expansion in order that in cooling it may grip the journal tubes, which are further secured in the ends of the main tube by passing the latter between rollers, for the purpose of bringing the metal of both the journal tubes into intimate contact with the metal of the main tube. This combined tube or hollow axle is afterwards turned in a lathe and finished in the ordinary manner.

The inventor states, "in order to more effectually weld, roll, and draw out the articles herein-mentioned, I prefer to adopt the method described in the Specification of a Patent granted to the late Richard Prosser, of Birmingham, in which a mandril and four rollers in equal segments, forming a circle, rotating together at equal speed in their revolution are used;" this Patent is dated March 27, 1840, No. 8454.

[Printed, 4d. No Drawings.]

A.D. 1858, March 30.—N° 674.

STEVEN, THOMAS, REID, THOMAS and FREW, THOMAS.—This invention relates to the forming of green sand cores for metal pipes and other cylindrical and hollow castings. The core box, wherein the core is moulded, is made in two longitudinal half sections, which when together form a hollow cylinder. When the lower section or half is partly filled with sand, the core bar is laid in and adjusted centrally, and then it is filled up with sand which is rammed or pressed in along both sides of the bar; the other or inverted half of the core box is then placed in position upon the lower half, and the sand is introduced through one or

more longitudinal narrow openings at the top, and rammed or driven in; it is also rammed or forced in at the ends to give firmness to the core bearings. By this means (it is stated) the core has more uniform solidity, and is better adapted for use. In order to prevent any shifting of the core, wedges are introduced between the projecting ends of the core bar and the flask which contains the upper portion of the mould. That portion of the core opposite the longitudinal openings is reduced and finished to the required form after the inverted half of the core box is removed, by suitable scrapers and appliances.

Cores for forming the bore in long pipes of small diameter may have a portion of dry sand introduced about midlength, and thickness nails may be used to support them.

Forming cores from the mould, is effected by lining the mould with clay or other plastic substance the desired thickness of the casting, and when dry it forms a core box wherein the core can be moulded.

[Printed, 1s. Drawings.]

A.D. 1858, April 14.—N° 803.

HOLMES, WILLIAM CARTWRIGHT, and HOLLINSHEAD, WILLIAM.—This invention relates to the use of superheated steam, heated air, or hot water, for maintaining at a uniform temperature the metallic moulds used in casting certain articles of metal. The current (by preference of steam) is introduced and passed continuously over the external surface of the mould through passages and spaces formed by outer casings or jackets, previous to and whilst the molten metal is poured into the moulds, for the purpose, in the first place, of heating the mould to a suitable temperature, in order to prevent the sudden chilling of the casting, and, secondly, to carry off the heat, which often proves injurious to the metal mould. The castings, if found to be too brittle, are transferred to an annealing furnace as soon as the metal sets.

Superheated steam is also employed for drying cores and sand moulds, which may be placed in ovens with jackets, wherethrough a constant current of superheated steam is passed, or when drying cores formed on hollow core barrels, the latter may constitute passages for the steam. In these drying processes, the steam which has been employed for heating the metal moulds, and the *heat of which* has been augmented by the additional amount of *heat carried off from the molten metal by conduction through*

the substance of the mould, may be used with advantage. The cavities formed round the moulds by the jackets and the core barrels are put into communication with the superheated steam, by suitably arranged pipes and taps.

[Printed, 1s. 8d. Drawings.]

A.D. 1858, May 6.—N° 1007.

HEAP, WILLIAM.—This invention relates to a peculiar form of joint or coupling, designed for connecting or adjoining metal pipes. It consists, when applied to pipes of soft metal, in passing on to the end of each of the two pipes which are to be joined together a nut or loose collar screw-threaded externally, and then by any convenient means, such as the forcing in of a conical plug, the pipe ends are caused to expand, and the extreme end of each pipe respectively is afterwards hammered out to form a flange against the end or annular surface of the collar; an internally screwed muffler or annular band is screwed half its length on to the collar of one pipe, and the collar on the other pipe is screwed into the other half length of the muffler, and when, by the aid of a spanner or by other means the flanged ends of the pipes are forcibly drawn together, a secure joint is effected.

Neither solder nor packing are required, other than a little white lead between the contiguous ends of the two pipes. In applying the "invention to iron and other hard metal pipes, the "externally screwed collars are screwed on to the ends of the pipes "to be joined, in place of being loose thereon."

[Printed, 8d. Drawing.]

A.D. 1858, May 11.—N° 1055.

PARKES, ALEXANDER.—The object of this invention is to improve the manufacture of tubes and cylinders.

To this end, "in place of employing hollow cast cylinders of "copper, German silver, or other alloys of copper, I use for such "purposes cast discs or discs cut from comparatively thick sheets "of copper or of German silver or other alloy of copper, and "then, in order to produce short and comparatively thick tubes "or cylinders therefrom, suitable for being extended, by drawing "rolling, hammering, or other means by which cast tubes of like "metals have been heretofore extended), I subject such discs to "a raising process by means of forcers actuated by steam in like

“ manner to that in which steam hammers are actuated, and by  
 “ such steam forcers I cause the discs to be raised by means of  
 “ dies, through which the metal is forced, or as it is technically  
 “ called ‘drawn through,’ in a similar manner to what is now  
 “ very commonly practised in respect to thin sheet metal by  
 “ forcers worked by fly presses; or the discs may be forced by  
 “ the steam forcers into hollow dies, such as are used when  
 “ stamping sheet metal. When using German silver in making  
 “ tubes or cylinders, I prefer to cast a short hollow cylinder, and  
 “ then to extend it into the length and dimensions desired; and  
 “ I also in some cases combine German silver with copper, brass,  
 “ or other tube, in order to coat the same with German silver.”

Castings German silver into the form of short tubular ingots, and afterwards extending such tubular castings by a rolling process, or by drawing them through dies. These tubes are used for covering other tubes of inferior metal, such as copper or brass, on which they are to be drawn and rolled, no mandril being required.

[Printed, 4d. No Drawings.]

A.D. 1858, May 17.—N° 1100.

HILER, SELAH.—(*Provisional protection only.*)—The nature of this invention, which relates to the manufacture of articles such as rods, tubes, bolts, &c., consists in making such articles of coated or plated iron, instead of solid brass as heretofore. The process is described by the inventor as follows:—“I take a  
 “ suitable sheet, bar, or block of wrought iron (or steel) and  
 “ clean the surface thereof on one or more sides and heat the  
 “ same, and while heated cast on to said surface or surfaces the  
 “ brass or other metal, and the union may be accelerated by the  
 “ use of borax or other flux, or the coating metal may be united  
 “ to the iron while the latter is in a state of fusion, and the brass  
 “ or other metal is to bear the desired proportionate thickness to  
 “ that of the iron.”

The iron and brass, or other plating metals may then be rolled  
 “ down to the desired shape or thickness, or cut out, or made up  
 “ into any articles for which said plated or coated iron may be  
 “ adapted, such as buttons, stair rods, tubing, bells, hinges,  
 “ bolts, and other articles.”

[Printed, 4d. No Drawings.]



A.D. 1858, June 8.—N° 1289.

BROOMAN, RICHARD ARCHIBALD.—(*A communication from Messieurs Liébaut and Egrot.*)—(*Provisional protection only.*)—The object of this invention, relating to the manufacture of copper pipes and tubes, is to produce such tubes and pipes either straight or curved, and without either seam or weld, “by depositing copper in a galvanic battery over and upon a core of lead, or other fusible metal or material capable of being fused or melted by heat, or otherwise reduced and removed. The core may be solid or hollow, and when hollow may be allowed to remain in the copper tube, or may be removed by melting or otherwise.”

[Printed, 4d. No Drawings.]

A.D. 1858, June 16.—N° 1368.

STEVEN, THOMAS.—This invention comprises the making of moulds for casting pipes and “other articles which can be divided into symmetrical halves by bisecting planes, or planes passing through their axes, and of which the halves require for their proper adjustment together the coincidence of at least two pairs of counterpart points in their sectional surfaces;” it also includes the making of cores.

In making moulds for pipes and similar articles half patterns are used, being made in duplicate by turning two pieces, which are capable of being afterwards separated into symmetrical halves, which will be the case if the axis of the lathe and the plane of their junction surfaces correspond. These patterns are for the sake of surface finish and durability preferred to be of metal, and when practicable made hollow for the sake of lightness.

In making a mould simply for a single pipe or similar article, one half pattern fixed on a plane surface is all that is required. Impressions of this half pattern are taken in the sand of two flasks, which when brought face to face form a perfect mould, provision being made that the points of adjustment of both flasks are parallel with and in relation to the half pattern equidistant, in order that when the impressions of the half pattern in the two flasks come together they may coincide.

In making pipe cores, a core box of the ordinary kind in two halves hinged together is used, and a core bar is so formed that passages are left for air and vapour, rendering it unnecessary to

form such passages by means of rods or prickers in the ordinary way. Axle bushes for cart wheels are cast in chills.

[Printed, 8d. Drawing.]

A.D. 1858, June 23.—N° 1418.

CLIBRAN, WILLIAM, and CLIBRAN, JOSEPH.—This invention of apparatus, respectively for distributing, regulating the pressure, and lighting and burning gas, relates,—

1st. To a mode of adjoining the mains and pipes laid down for its conveyance and distribution, the object being a perfect joint, which will permit of the movement consequent on the settling of pipes which are newly laid. The arrangement shown and described admits of the pipes being laid out of a direct line or curving horizontally, but provides only for the vertical movements. For this purpose each pipe has at one end the form of a zone or section of a sphere or ball, and at the other end a socket or hollow section of a sphere, and when the two are brought into junction with other similarly-formed pipes, they constitute an articulated series of ball-and-socket joints. These joints are held together by bolts and nuts, which pass through projecting lugs on the pipe ends, and are so arranged as to permit of motion in the pipes without injuring the junction.

2nd. Relates to combining gas governors and stop taps in one piece or apparatus.

3rd. To governors adapted to street lamps, and,

4th. To arrangements for facilitating the lighting of gas lamps, and especially street lamps, the object being to light such lamps without removing or opening the parts which protect the light from the wind and weather.

A more detailed description of the last three parts of the invention will be found in the vol. of Abridgments exclusively devoted to such subject.

[Printed, 10d. Drawing.]

A.D. 1858, July 13.—N° 1577.

WILSON, ROBERT and HORWOOD, ALBERT.—(*Provisional protection only.*)—The aim of this invention is to improve the mode of connecting or adjoining the ends of cylindrical or nearly cylindrical pipes or tubing of metal, water hose, or pipes adapted to other purposes, the object being the formation of a secure joint possessing a certain amount of flexibility.

For this purpose (as stated by the inventors,) "we have a length of india-rubber or other elastic tubing, into which we insert the ends of the two pipes to be joined on the outside of the elastic tubing; we have one, two, or more metal clips or clasps screwed with one or more set screws or bolts, so as to press the elastic tubing around the pipes. The clips may be made of a circular form, or in halves, with lips, and screwed together or secured by means of a spring. When more than one clip is used for the joint, we protect and strengthen the elastic tubing, if required, by a coil of wire, either inside or outside, or both ways, or by strands or hoops, or straight wires or pieces of metal."

[Printed, 4d. No Drawings.]

A.D. 1858, July 20.—N° 1635.

HILL, JOHN CARTWRIGHT.—This invention relates to connecting or adjoining the ends of metal pipes.

For the purpose of adjoining the ends of two leaden pipes without soldering, they are after first being scraped clean, inserted in the opposite ends of a muffler or collar formed of a piece of pipe of larger diameter.

To this collar is externally applied a compressing tool or apparatus, consisting of a cylindrical iron case, which embraces the lead collar piece whilst the ends of the latter are driven or drifted up by dies or otherwise, and forced into intimate contact with the surface of the two pipes. The joint is then finished, and the compressing tool or case is removed, to facilitate which it may be made in halves or sections.

"Joints may thus be made when the pipes are full of water or other liquid, and even when the water is exposed to pressure and is squirting out at the junction. In some cases, or when an excessive pressure is to be applied, a short piece of iron or other pipe may be placed within the two pipes to be joined, so as to support them while the joint is being made, and if it be required to preserve the full waterway in the pipe, the ends of the pipe may be enlarged for the reception of this short piece of pipe. I join iron and other pipes in a similar manner, by applying a collar or short tube of lead or tin, or other compressible metal over the junction, and compressing it with a compressing tool. A shorter piece of iron pipe may be placed under the lead collar if desired . . . Rods and many other articles



" may be joined in a similar manner, the form of the collar or  
" piece of lead or other compressible metal and of the compressing  
" tool being varied accordingly."

[Printed, 8d. Drawing.]

A.D. 1858, July 28.—N<sup>o</sup> 1705.

HARDEN, HENRY.—The object of this invention relating to the construction of multitubular steam boilers, is to remove the objections urged against the iron tubes, by reason of that metal not possessing sufficient ductility to withstand the amount of drifting necessary to secure their ends perfectly fluid-tight in the tube plates; and for this purpose in order to remove such objection, the ends of such tubes are made of brass or copper alloy, or of the metal known as "homogeneous" metal or "homogeneous steel," or of any other suitable ductile metal which may be secured to the iron part of the tube by brazing or otherwise, short ends of homogeneous steel being preferred, because that metal is found to possess the requisite amount of ductility, and the tubular ends may be united to the iron by welding, the ends of the iron tube being jumped up or thickened and chamfered in order to obtain a greater breadth of surface for the junction, that end of the short pieces which unites with the iron being correspondingly shaped.

[Printed, 8d. Drawing.]

A.D. 1858, August 4.—N<sup>o</sup> 1769.

RUSSELL, JOHN JAMES.—This is an invention of a duplex machine adapted for cutting off and screwing the ends of tubes.

Each tube is passed through and fixed in a hollow mandril, which is mounted in a suitable frame or headstock disposed between two beds or guides, whereon are respectively disposed two sliding carriages, each of which carries tools suitable for cutting off and screwing the ends of the tubes which, whilst being cut, are supported by a suitable bearing consisting (by preference) of three rollers. "In some cases, the carriage, in place of having two sets of tools, is arranged with only a cutter or with a screwing tool or die. By these means tubes may be cut to the lengths desired, and screwed at the ends with great facility, and without requiring to be moved from place to place between the processes of cutting off the ends and making the screws."

[Printed, 1s. 8d. Drawings.]



A.D. 1858, August 7.—N° 1804.

**WALKER, JAMES.**—This invention relates to the construction of collapsible core bars, adapted to form the bore or internal cavity in pipes and cylinders when set to the required size, but when required to be withdrawn, their diameter is capable of reduction by mechanical means.

The core bar externally consists of a metal shell or cylinder, which is cut or slotted longitudinally throughout its whole length to permit of its distension and contraction. This shell is supported by an axle or shaft, whereon at one end is placed a cap or "faucet piece" that carries a cylindrical flange, which embraces the shell or cylinder. The distension and the contraction of the outer cylindrical shell (as first described) is effected by internal mechanical devices which are operated at the ends by means of longitudinal sliding bars, that carry at intervals wedge formed pieces which come in contact with inclines.

According to a modification the distension of the cylinder is effected by eccentrics, which are fixed on a longitudinal rod in a position to bear against, and when the rod is turned, force outwards the lips of the longitudinal opening in the external cylinder or shell.

[Printed, 8d. Drawing.]

A.D. 1858, August 16.—N° 1868.

**HERRMANN, LOUIS ADOLPHE, and HERRMANN, ERNEST INNOCENT EMILE.**—This is an invention relating to various contrivances devised for connecting or adjoining the ends of pipes; it also relates to valves and to regulating the flow of liquids.

Pipes without flanges are adjoined by means of an annular band or muffler of lead, into which the contiguous ends of the two pipes are thrust and meet, and this lead muffler is compressed and forced into close contact with the pipe ends by two conical flanged rings, which are slid, one on to each end of the muffler, and are drawn towards each other by cramps or screws. Instead of two compressing rings, one ring in two parts respectively furnished with lugs for tightening screws, may be employed.

The adjoining ends of pipes with small flanges are covered with soft packing, over which is placed a band of soft metal, that is embraced by a band or collar of hard metal. The adjoining ends of pipes are also bevelled for the reception of the packing, and

one flanged pipe may be connected to the plain end of another pipe, by compressing a ring of soft metal on the latter, so as to bring it into intimate contact therewith, and with the face of the flange of the other pipe by means of a rigid ring, which is drawn towards the flange by screws.

The end faces of the flanges of adjoining pipes have annular recesses formed to receive a packing ring of soft metal, which becomes compressed when the flanges are drawn together; and pipes of soft metal have their ends opened to receive a hard metal ring, which forms an internal support against external compressing rings and screws.

Branches are connected by means of T or hooked pieces, which are passed through the opening of the pipe to which such branches are connected, soft metal being interposed between the adjoining surfaces.

For adjoining a small to a larger tube, an intermediate lining of lead is used, having its ends turned, one over the end of each tube.

The other parts of the invention relate to the valves employed for regulating the flow and discharge; these will be found described in the volume of Abridgments especially devoted to that class of inventions.

[Printed, 1s. 10d. Drawings.]

A.D. 1858, August 20.—N° 1895.

**DROINET, LOUIS FELIX HENRI.**—(*Provisional protection only.*)—This invention relates to "bearings and packings for rotating and reciprocating shafts, the joints of pipes, and other like purposes."

"These bearings and packings are composed of three or more segmental blocks, which when brought together form a circular hole on the inside for the reception of the shaft or pipe. Each segment is pressed inwards by a spring or springs. Two or more rows of these segments may be used, one over the other, and the segments in one row should be arranged so as to break joint with those in other row or rows."

[Printed, 4d. No Drawings.]

A.D. 1858, September 13.—N° 2075.

**HANBURY, SAMPSON.**—This invention relating to the manufacture of tubes of copper, brass, and other metals, consists (it is

stated) in making the metal of such tubes gradually thicker towards the ends than it is along their intermediate length, and that such "method of constructing tubes will be found of great advantage where light tubes are desired." The external diameter of the tube is uniform throughout its whole length. It is however stated, that the invention is not confined to having the additional thickness formed inside, and that it may be external.

[Printed, 6d. Drawing.]

A.D. 1858, September 23.—N° 2137.

JALOUREAU, ALFRED FAUVIN.—This invention relates to manufacturing pipes suitable for the conveyance of water, gas, or telegraph wire, out of paper, cloth, wire gauze, or other fabricated tissue or substance. It consists in superposing by rolling successive layers of the fabric or material on a mandril, such material being saturated and made adhesive by immersion in a bath of mastic or solution of caoutchouc, melted bitumen, or other water proof material, kept in a liquid state if necessary by the application of heat. The fabric or substance of which the pipe is to be formed, is placed on a roller in front of the apparatus, and is led down an incline to pass beneath a drum roller, which is partly immersed in the mastic or other fluid or bituminous substance. The mandril rests upon the drum roller, and as the latter revolves, it brings up the saturated fabric to beneath the mandril and is wound thereon. When a sufficient number of laps of the fabric are rolled on the mandril, the latter is taken and rolled upon a bed of sand, and then more bitumen and again sand is applied, the process being finished by slipping the tube off the mandril on to a wood roller, where in a vertical position it remains and hardens, the inside and outside being finally varnished.

Pipes of thin sheet iron, without having their seams rivetted, soldered, or welded, are enveloped in rolls of bituminized paper, cloth, or other fabricated substance. Branches may be connected to these composition pipes, and they may be made of various lengths and diameters. For the purpose of connecting them end to end, a short length of tube fitting their internal diameter, is inserted somewhat less than one-half of its length into the end of each, and a short length or muffler, cut off a larger pipe, is slipped externally over the junction, the small space left between the ends of the two pipes being filled with bituminous matter, which in a

heated state is poured in through a hole in the muffler, made there for that purpose.

[Printed, *ed.* Drawing.]

A.D. 1858, September 30.—N° 2183.

RUSSELL, JOHN JAMES.—The object of this invention is to improve the construction of the furnaces employed in heating iron and steel suitable for the manufacture of welded tubes and other articles. Each reverberatory furnace is made with several fire-places at one end, separated by a bridge from the body of the furnace which, instead of being in one is divided into two working sections or compartments, each having a door situated respectively on opposite sides of the furnace.

“ The bed of each working compartment is inclined in a direction from the working door towards the opposite side of the furnace, so that the bed is highest at the door, and the two working compartments are separated by a bridge or partition which is constructed in an inclined direction across the furnace from side to side, so that each of the two beds of the working compartments of the furnace is wider at the end where the working door is situated than it is at the further end. At the back end of the furnace is formed a hollow bridge, over and under which the flames pass from the fire-places and the body of the furnace to the chimney. This hollow bridge forms an oven from side to side of the furnace for the introduction of the iron or steel in order to the same being preparatorily treated.”

[Printed, *1s. 2d.* Drawings.]

A.D. 1858, October 6.—N° 2217.

LUIS, JOSÉ.—(*A communication.*)—This invention relates to connecting or joining pipes and tubes of wrought and cast iron and other materials. Three different contrivances are devised for the purpose, and described and illustrated.

1st. Consists in connecting the ends of pipes by means of iron muffles, which are lined internally with lead. A short distance from each end of a pipe (rather less than half the length of the muffle) is cast or formed on the pipe a shallow annular collar or projection, and between this projection and the end, there are two annular grooves which are to be filled with hemp or wool saturated



or "done over" with grease and black lead; the ends of the pipes respectively are introduced and forced, one into each end of the muffle, and the end surface of the annular collar is by means of a screw or the blows of a hammer, driven into the end of the leaden lining of the muffle, penetrating about the tenth part of an inch. If thought necessary the ends of the lead lining may be drifted or beaten down so as to close on the periphery of the collars. When required to separate two pipes jointed by this means, it is necessary to chip away the collar on one of the pipes.

2nd. Is a socket joint. The socket is annularly grooved and lined with lead cast in, and the end of the pipe which it is to receive, has cast upon it the collar or projection, and is furnished with the annular grooves to receive the hempen or wool packing. This end of the latter pipe is forced into the socket till the front edge of the collar is embedded a short distance in the lead lining, and the joint is perfected by drifting down the end of the lead lining.

3rd. Relates to conical or tapering joints; the ends of the two pipes which are to be connected are plain, and respectively formed one to taper internally from the extreme end, the other to taper externally towards the end; upon the tapering end of this latter pipe is wound or bound hemp or wool impregnated with grease or wax or other unctuous matter, which when the end of this pipe is driven into the end of the other forms a joint impervious to water. The surfaces which joint together may be coated with a "gummy water-proof liquid," and a blade of lead may be introduced and its edge drifted down.

Describes the forming and jointing of tubes made of thin sheets rolled on mandrils.

[Printed, 1s. Drawings.]

A.D. 1858, November 10.—N<sup>o</sup> 2521.

SCHMIDT, GUSTAVE.—(*Provisional protection only.*)—This invention relates to the construction of collapsible core bars, for use in the casting of hollow articles, pipes, and cylinders, the object being to avoid the use of hay bands, and also the expense of such complicated core bars as are formed by longitudinal pieces or sections, collectively contrived to converge or diverge to or from a central axis by internal mechanical contrivances, and instead thereof to combine "together the several sections into

“ which a core bar is divided longitudinally, by hinging them  
“ each at one extremity to an end piece or plate, so that each  
“ section can move inwards on its hinge towards the central line  
“ or axis of the bar. When the core bar is required for casting,  
“ the different sections at their free ends are arranged round a  
“ short central plug, to which they are attached by suitable  
“ fastenings; and when the core bar is coated with loam, the  
“ casting is effected in the usual manner; afterwards, to with-  
“ draw the core bar, the central plug is removed, and the sections  
“ caused to fall inwards, and when thus freed from the article  
“ cast upon it, the removal of the core bar is easy.”

[Printed, *4d.* No Drawings.]

A.D. 1858, November 10.—N° 2523.

SCHMIDT, GUSTAVE. — (*Provisional protection only.*)—This invention in connection with the process of manufacturing cast-iron pipes, relates more particularly to the formation of the moulds. The pattern or model employed is a hollow iron cylinder of the ordinary description, “and this is laid on a table and  
“ secured to it by bolts; the top of this table is hollowed out so  
“ as to allow just one half of the pattern to descend below its  
“ upper surface. If the hollow formed in the table is wider than  
“ the diameter of the pattern, the extra space is filled by strips of  
“ wood put in on each side; on to the table and over the pattern  
“ a rectangular frame is placed, the ends of which are arched to  
“ pass over the ends of the pattern; the width and length of the  
“ opening in this frame are about one inch greater than the dia-  
“ meter and the length respectively of the pipe to be made. The  
“ portion of the pattern above the surface of the table is then  
“ covered all over with a suitable thickness of loam, the loam  
“ being brought to a uniform thickness by a bar or template  
“ moving about the central axis of the pattern; this coating of  
“ loam is dried by turning steam into the interior of the pattern,  
“ which is closed at the end and connected with a steam pipe for  
“ the purpose. When the loam is sufficiently set the rectangular  
“ frame is to be lifted up so as to withdraw the half mould of  
“ loam from the pattern, but before this is done (and before the  
“ loam is dried) it is closed in at the two ends by arched plates  
“ or castings, which are fixed by bolts or keys to the curved ends,  
“ and also to the straight sides of the rectangular frame, and on

“ these plates or castings are fixed bars connecting together the  
“ two end plates, and bearing on the surface of the loam. The  
“ bars are held against the loam at several points in the length of  
“ the pipe by semicircular pieces passing over the mould, and  
“ attached to the two sides of the rectangular frame. After the  
“ half mould has been removed from the pattern and been dried,  
“ the interior surface is finished, blacked, and again dried, and  
“ then two of the half moulds, with their supporting frames,  
“ plates, and bars, are clamped together, and a core introduced  
“ between them; afterwards the casting is effected in the usual  
“ manner.”

[Printed, 4d. No Drawings.]

A.D. 1858, November 26.—N° 2685.

DIXON, EDWIN, and FISHER, JOHN.—According to this invention relating to the manufacture of welded iron tubes, in addition to the one draw-bench which is usually placed opposite the mouth of the furnace, a second draw-bench disposed parallel with the first is also employed; after the seams of the partially formed tubes as they are drawn from the furnace are welded by the first bench, the tubes are handed over to the second bench, whereby the final drawing and finishing of the tubes in succession is accomplished. By this means the process is expedited, and a considerable saving of time is effected by causing one furnace to supply two draw-benches, which are respectively kept in constant operation, one in closing and welding the seams only, and the other in the final drawing and finishing of the tubes.

[Printed, 4d. No Drawings.]

A.D. 1858, December 3.—N° 2765.

PETERS, SAMUEL.—(*Provisional protection only.*)—This invention relates to the manufacture of pipes and tubes out of bands or ribbons of sheet metal, which “ is first heated in a suitable oven  
“ or furnaces, and then passed between rollers, of which the  
“ lower is grooved with grooves of various sizes, and the upper  
“ has corresponding projections, so that as the heated sheet or  
“ strip of metal is passed between the two in one or other groove,  
“ according to the size of the pipe or tube to be made, it may be  
“ pressed into the form of a U. The bent sheet or strip then  
“ passes between other grooved rollers in the same machine.

“ which impart to it a tubular form. The partially formed pipe  
“ or tube is then again heated in an oven or furnace to a welding  
“ heat, and passed through a pair of grooved rollers, the grooves  
“ of one of which are larger than the corresponding grooves of  
“ the other, and the former roll is driven at a less velocity than  
“ the latter. During its passage through these welding rollers  
“ the pipe or tube is supported by a double mandril.”

[Printed, 4d. No Drawings.]

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1859.

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A.D. 1859, January 11.—N° 87.

SIEMENS, CHARLES WILLIAM.—This invention relates to the construction of vertical metallic skeleton posts, adapted in substitution of the ordinary wooden posts for carrying the insulators which are employed to support the lines of telegraph wires; the invention also relates to jointing pipes. These metallic posts are composed of three principal rods or tubes, which when placed in vertical position relatively incline to an apex smaller than the base. These rods are held together at intervals by horizontal tie rods, which are turned down or crooked at each end, whereby they are respectively fixed to the uprights by means of a metallic strap or ring of lead or other soft metal. These straps, according to the number of cross stays required, are slipped on the uprights before they are raised, and one strap ring is required to fix the ends of two cross stays to one of the upright rods. This is effected by means of a screw cramp-frame and dies, which is caused to embrace the lead strap or ring when the latter is slid on the ends of the two stays, and by the compression of the dies the lead is forced convergently into such intimate contractional contact as to bind together the crooked ends of the stays and firmly fix them to the upright. This cramp-frame with compressing dies is employed to bind the ends of pipes which require connecting or jointing together. In the case of pipes of soft metal, such as lead, the extreme ends which meet are supported internally by a short length of annularly grooved rigid pipe *entering partly* into each, but this is not required upon the ends of pipes which are capable of bearing the pressure without sup-



port ; the annular grooves are then formed on the pipe ends, and the dies have transverse annular projections to correspond, so that when the latter impinge upon the strap ring, it receives their impression externally, and is forced internally into the annular grooves on the pipe ends, or in the rigid supporting pipe, which produces a series of annular undulations of the strap ring that embrace the annular grooves in the ends of the pipes.

[Printed, 1s. 6d. Drawings.]

A.D. 1859, January 17.—N° 144.

COLLIER, GEORGE, and COLLIER, JOHN.—This invention relates to “means or apparatus for washing and drying wool and “other fibres; part of which improvements is also applicable for “other purposes where steam, hot water or other fluids are “required to be conveyed under pressure through moveable “connections.”

According to one arrangement the wool or material is carried by an endless web through the wash liquor, which by means of beaters, force pumps, other agitators or otherwise, is caused to pass through the material, which may also be carried between expressing rollers in the liquor, and afterwards between heated revolving cylinders to be dried.

These drying cylinders have tubular axes for the purpose of being heated by a current of steam, the axis being the only point at which the steam can be admitted whilst a cylinder revolves. In place of the hemp or other such like packing heretofore used for making the junction of the revolving axis with the fixed steam pipe fluid-tight, either the axis or the pipe is coated or lined with tin, lead, copper, or other soft metal, which works in frictional contact with the hard metal of the other part, and it is preferred that the surfaces thus working in contact should have a conical form.

[Printed, 4d. No Drawings.]

A.D. 1859, January 19.—N° 161.

CLARKE, THOMAS.—This invention relates to the construction of core barrels employed to form the internal bore or cavity in hollow columns and piles, pipes, and cylinders. The inventor states:—“Heretofore core barrels have been constructed with one “row of hinges only, and a loose key or slide, which slide has

" had to be removed every time a fresh casting is produced,  
" whereas . . . my invention . . . has two rows of  
" hinges, and is without slide or key, but has three stay bars,  
" which stay bars when loosened, as can be simply and easily  
" done, allow the core bar to leave the casting without impediment, thereby effecting considerable saving of labor, time, and  
" expense."

The core barrel is comprised of three longitudinal sections, which are hinged together at the edges and form a cylinder, whereon is plastered the coating of loam, more or less thick according to the required size of the bore of the pipe; when the latter is cast the sections of the core barrel are caused to collapse, and separating from their loam covering may be easily drawn out. The use of haybands is entirely dispensed with, there being instead, holes through the shell or surface of each of the segmental sections, to permit of the escape of the gas and air.

[Printed, 10d. Drawing.]

A.D. 1859, January 22.—N° 206.

RAMMELL, THOMAS WEBSTER.—This invention relates to atmospheric propulsion, to the tubes, the constructional arrangements of the line of way, and the general appliances employed, the object being to propel along such lines carriages containing passengers or goods, and piston carriers bearing letters, parcels, or goods from place to place, the chief object being the so constructing of iron the lines of way that they might be conveniently laid centrally along wide streets and thoroughfares. The engineering details, construction of the way lines on columns, arrangements at the termini for shifting the trains from one line of rails to another, the mode of working the intermediate stations, and the general railway machinery and appliances, will be found more particularly described in the volume of Abridgments devoted to such subject.

The propulsion tube for any line of railway worked by propulsion has by preference an internal longitudinal groove, cast or cut in its lower part or side for the wheels of the piston to travel in, and at each station throughout a propulsion tube, a valve chamber is interposed and used for the reception of the travelling piston, wherein the latter comes to rest.

*The pneumatic tube employed for the transmission of letters, parcels, &c. is made in convenient lengths with faced flanges at*

the ends, between which a packing of prepared canvass or of india-rubber is interposed when they are bolted together in one continuous length. For the purpose of causing the transmission of the piston carriers from a direct to a branch line of tubes, the two intermediate tubes or sections respectively communicating one with the main line and the other with the branch at the point of junction, are laid on a platform capable of sliding transversely to the direction of the line of tubes, so that communication may either be continued through the main line, or opened with branch lines as may be desired.

[Printed, 1s. Drawings.]

A.D. 1859, February 16.—N° 435.

RUSSELL, JOHN JAMES. — This invention relating to the manufacture of tubular cylinders from plates of wrought iron, consists of an apparatus designed for welding together the edges of the bent plates, which are temporarily so fixed in position together, as collectively to form a tube or cylinder. That section of the apparatus which performs the welding operation, consists of a strong upright frame, whence project horizontally one above the other, two strong jaws, near the ends of which are fitted two welding dies; the die in the lower jaw is fixed, but the die in the upper jaw is fitted in the lower end of a sliding tool holder, to which the necessary up and down motion is given by an eccentric. The plates having been bent and fitted together in the form of a cylinder, the latter is so placed on rollers disposed at intervals along the side rails of a small truck or carriage, that when required it may be turned on its axis when the cross or ring seams are being welded, but it moves with the carriage when the longitudinal seams are being operated upon by the dies, the lower jaw and die projecting within the cylinder beneath the seam, and the upper jaw above. The metal of the cylinder is heated along the seams by means of two small blast furnaces, one disposed externally and the other inside the cylinder, the necessary means being provided for conveying their respective hot draughts direct at the same time upon one part of a seam, one heating externally and the other internally, and as the seam is thus heated, it is moved forward and operated upon by the dies, the face of the lower die being convex, and of the upper die concave, corresponding to the curve of the cylinder.

The heating of the seams may be effected by gas, and instead of using dies, two rollers, one inside the cylinder and one above may be used.

[Printed, 1s. 4d. Drawings.]

A.D. 1859, February 16.—N° 439.

**BREEDEN, JOSEPH.**—This invention relates to the construction of various machines or mechanism adapted to the different processes connected with the manufacture of taps or stop-cocks, and fittings for gas, steam, and water pipes, including the parts known as swing joints, universal swing joints, union joints, bracket backs, swing pendant tops, &c. The machinery comprises:—

A machine for making the plugs of taps and stop-cocks. This machine is constructed and operates on the principle of a turning lathe.

A machine for squaring the end of the plug on which the washer fits, operates by means of a revolving cutter.

A machine for cutting away a portion of the top of the barrel of a tap or stop-cock, in order to leave a shoulder which limits the action of the plug.

A machine for screwing the screw-blanks for stop-cocks, and for tapping the holes in the plugs.

A machine for slitting or slotting the screws or screw blanks.

A machine for turning the washers of taps or stop-cocks.

These machines are chiefly constructed to act on the principle of the ordinary lathe, the drilling or the shaping machine, and have severally additional appliances, specially adapted to the production in part or entirely of that particular article for which they are designed.

[Printed, 2s. 4d. Drawings.]

A.D. 1859, February 23.—N° 490.

**RIDGE, SAMUEL.**—This invention relates to a joint-ring or packing, to be used between the flanges in coupling or making the joints of pipes, and between the surfaces requiring to be united. The inventor says “in performing my invention I make use of a “double frame made of lead or other suitable metal or material, “between which the cement is held; the inner side of this frame “*I prefer to make of about the same size as the orifice in the “pipes or other articles to be coupled or jointed together, and*



“ the outer part of the double frame comes either within the bolts  
 “ by which the pipes or other articles are bolted together, or the  
 “ bolts pass through the double frame ; the double frame pro-  
 “ tects the cement from the atmosphere and from the air, water,  
 “ steam, or other fluid in the pipes or other articles. In order to  
 “ prevent leakage through the bolt holes, I make a groove con-  
 “ taining a cement in the washers, and I place a washer under  
 “ the head or under the nut ; these improved washers are chiefly  
 “ beneficial in securing the manhole frame to boilers, or in other  
 “ cases where the bolt head or nut is exposed to the steam or  
 “ other fluid in the boiler or other article.”

“ Pipes and other articles can be jointed together both expedi-  
 “ tiously and economically, and as the cement is protected from  
 “ the action of the fluid within the pipes or other articles,  
 “ the joint when made is immediately ready for use.”

[Printed, 10d. Drawing.]

A.D. 1859, March 21.—N<sup>o</sup> 707.

HAGGETT, WILLIAM.—This invention consists in giving to iron and other metals, and to such other materials as will retain impressions, an undulating surface composed of longitudinal corrugations or indented lines relatively parallel and crossed by similar transverse lines, or the corrugated or indented lines may cross in diagonal directions, the result being ornamental surfaces covered all over with squares or diamonds in relief. This effect is produced by rolling, pressing, moulding, or casting, and metal plates and other substances so treated, it is stated, are rendered stronger and more suitable for many ornamental, mechanical, and useful purposes.

“Tubular and other beams and girders of any length and  
 “ strength, for building, railway, and other purposes, may be  
 “ formed of two or more plates of iron corrugated as herein-before  
 “ described ;” and amongst a great many other adaptations to which as stated by the inventor these metallic plates and other surfaces may be applied, mention is made of tubular and other bridges and pipes.

[Printed, 6d. Drawing.]

A.D. 1859, March 23.—N<sup>o</sup> 735.

ORAM, SAMUEL.—The object of this invention which relates to metallic tubes adapted to the construction of steam boilers and

condensers, is by indenting the surface of such tubes in various ways to obtain increased heating or cooling surface, and cause the currents which pass through and over them, to take a variable direction. Several examples of these tubes are shown in the drawing, comprising tubes indented spirally; tubes formed with an internal projecting head; tubes alternately increasing and diminishing in diameter throughout their whole length; tubes indented at intervals, and tubes with a narrow plate or ribbon of metal, which is partly inserted in the seam of the tube before it is closed, so that one longitudinal half of the ribbon projects into the tube, and the other half projects from the tube externally.

[Printed, 6d. Drawing.]

A.D. 1859, April 4.—N° 835.

POTTS, FERDINAND and BROUGH, ROBERT.—(*Provisional protection only.*)—This invention relating to the apparatus for and mode of constructing calico printer's rollers, and other metallic tubes, "consists in forming a taper tube of sheet iron, " or other metal of any convenient thickness, upon a perfectly " true mandril of the right degree or amount of taper; this tube " may be jointed or not, as desired, and while yet on the mandril " or filled with sand we lay it in a pair of moulds, and cast on to " it a coating of cast iron of sufficient thickness, which we turn " down on the ends and face, taking care to preserve the concentricity of the inner tube or now taper hole; we next form a " billet or seamless tube of copper, which we draw out to the " proper thickness and size, so that it may be placed on the cast-iron cylinder, before described, and by passing them in this " condition between rolls, or by pulling or forcing them through " holes in the manner in which tubes are formed, the copper case " will become firmly fixed on the iron cylinder, and has only to " be turned and finished off to be fit for use, thus we obtain an " economic roller with all the advantages as if it had been made " solid, and the taper hole turned or bored out, an operation " attended with great expense and trouble. In some cases a nib " is required to project inward from the large end of the taper " hole; this we obtain by fastening the nib to the sheet iron or " other tube first made, by pinning, rivetting, or otherwise before " casting the iron upon it, and instead of reducing and applying " our outer covering or copper case by means of a common draw-

“ bench and an endless chain, we purpose in some instances  
“ applying to this operation hydraulic power . . . that may be  
“ decreased or increased at pleasure.”

“ By the agency of this hydraulic arrangement we are enabled  
“ to draw with more facility and less wear and tear, every descrip-  
“ tion of tubes or drawn metals that require in their formation  
“ either to be pulled between rollers, holes, dies, or any other  
“ tool, as commonly used in their formation of solid, seamed,  
“ cased, and other tubes or mouldings. And our further improve-  
“ ments in the application of hydraulic power for the preparing  
“ of sheet metal for the formation of tubes, and which is also  
“ applicable to the reducing or rolling of metals in general, con-  
“ sist in forming a suitable cylinder or cylinders connected with  
“ the frame or carriage in which rollers are set up for the rolling  
“ of metals, and which cylinders are so arranged that by means of  
“ plungers connected with the bearings on or in which the rollers  
“ work, by forcing in or allowing water to escape from such  
“ cylinders or chambers, the rollers will be set more apart or  
“ closer together, as desired, or according to the nature of the  
“ metal that is being rolled.”

[Printed, 4d. No Drawings.]

A.D. 1859, April 8.—N<sup>o</sup> 878.

MENNONS, MARC ANTOINE FRANÇOIS.—(*A communication from Victor Doré*).—This invention relates to a system of articulated joints, constructed on the principle of the ball and socket, and adapted to the jointing or connecting two or any number of pipes together in a continuous length, without regard to levels, inclines, or direct lines. One end of each pipe has formed upon it a spherical enlargement, and on the other end there is a spherical socket, which receives the spherically enlarged end of the pipe to which it is connected, and also a packing of lead, which is driven into the enlarged fore-end of the socket, bedding against the spherical enlargement on the end of the other pipe.

It (as stated by the inventor) “is evident that by combining a  
“ number of these articulations, any required curve or inclina-  
“ tion may be given to the pipes laid down, thus avoiding the  
“ formation of the fixed joints with acute angles now generally  
“ employed.”

"This arrangement may to some extent be altered in practice according to the requirements of the locality or position in which the pipes are laid, and the kind of work for which they are intended; but for all ordinary purposes it will be found amply sufficient in its present form."

[Printed, 8d. Drawings.]

A.D. 1859, April 14.—N° 943.

**MCDUGALL, ALEXANDER.**—This invention for coating metallic surfaces with a compound preparation of sulphur, asphalt, pitch or other bituminous substances, and beeswax, relates more particularly to the coating of metallic pipes. The relative proportions of the combined substances forming the preparation, consist of one part by weight of sulphur dissolved in two parts by weight of heavy oil of tar or other solvent, such as spirits of turpentine or resin oil. In this solution of sulphur, five parts by weight of pitch or asphaltum are dissolved by heat, and to every twenty parts of the product is added one part of beeswax.

When this compound coating preparation is applied to iron pipes, telegraph wires, and metal surfaces, they should when heated to about 400° Fahr. be immersed in a bath of the preparation heated to the temperature of boiling water, and for coating lead pipes internally the heated preparation may be poured in whilst the pipes are in process of being made.

[Printed, 4d. No Drawings.]

A.D. 1859, April 21.—N° 1010.

**TRUSS, THOMAS SEAVILLE.**—This invention relates to the preparation for and mode of jointing pipes, which is effected by means of a strap formed in two or more segmental parts, which are held together and tightened up by nuts and screws. This strap fits to and embraces the rounded edges of the flanges of the two pipes when they are brought together, an annular space being formed between the two flanges and the strap for the reception of a packing of india-rubber, which is preferred when jointing pipes for the conveyance of water, steam, or air, but for gas, worsted packing saturated with a solution of alkaline salt is preferable.

A modification of this system of jointing is shown, wherein the periphery of the flange of one pipe is screw-threaded to receive



screw threads formed on the corresponding side of the strap, the other side of the strap being flanged internally to press against the back of the flange of the other pipe, the packing being interposed between. These joints are to a limited extent flexible and expandible.

[Printed, 8d. Drawing.]

A.D. 1859, April 25.—N° 1040.

WARNE, WILLIAM, FANSHAWE, JOHN AMERICUS, JAKUES, JAMES ARCHIBALD, and GALPIN, THOMAS.—This is an invention of a packing adapted to make tight the connections or joints of steam and other pipes, and applicable also as packing for machinery. It consists of a compound or metallic cement, formed by combining fine particles of metal or metallic ores or oxides, either with or without sulphur, with caoutchouc, gutta-percha, or other elastic or resinous gum, bituminous, or gelatinous substance. Sal ammoniac, or any other agent that will in the presence of water set up a corrosive action, is to be used in addition.

The relative proportions preferred to be taken of the several ingredients to produce a cement or compound of this description are, of caoutchouc, two parts; of gutta percha, one part; of hydrochlorate of ammonia, one part; of sulphur, one part; and of iron filing or borings, ten parts. The product is to be rolled or moulded into sheets, and afterwards cut or stamped out to the form required. The proportions of the ingredients according to the intended use of the cement may be varied, for example, an excellent metallic cement or packing for the joints of pipes may be made by using only a small proportion of caoutchouc or other gum or substance, simply sufficient for combining and holding the metallic and other particles together.

The invention also includes several other compounds or cements and combined substances, which in a plastic state are adapted to a variety of useful purposes.

[Printed, 4d. No Drawings.]

A.D. 1859, May 13.—N° 1200.

GOURLAY, ROBERT.—This invention relates to casting metallic pipes, columns, and similar articles from models which form their own core.

The model or "pattern used is in two halves, and is of such shape and dimensions as to serve for forming both the external portions and the internal or core portion of the mould. One half of the external mould being formed in the usual way and one half-pattern being in it with its inside upwards, a core bar or core skeleton, constructed as herein-after more particularly described, is placed in this the lower half-pattern, and sand is rammed in to form the lower portion of the core. The top half-pattern is next placed in position, and the ramming of the core is completed through narrow openings formed for the purpose in this top half-pattern; these openings being filled up, the top external half-mould is rammed upon this top-half pattern. In this way the core is formed on its proper position in the mould, and it has merely to be lifted out for the removal of the pattern, and to be afterwards replaced without needing any subsequent adjustment; at the same time the mode of completing the ramming of the core insures its possessing the requisite firmness and consistency. The core skeleton consists of one or more longitudinal bars according to the size of pipe or other article, such bar or bars being formed with numerous ribs or lateral projections to strengthen the core, and to retain the sand forming it. It is held down in position by end plates or bars, which are keyed or otherwise firmly secured to the mould box or to fixtures embedded in the floor of the moulding shop. The exact position of the core skeleton is determined by semi-circular or other discs or blocks on the end or ends thereof, such discs or blocks fitting in recesses provided for them in the mould box. When the article to be cast is of such a shape as that the core skeleton cannot be drawn out entire, as in the case of branched pipes, for example, such core skeleton is made in parts which can be firmly connected and easily disconnected. The employment of a core skeleton of this improved kind enables the moulder to use green sand cores and to dispense with thickness pegs, or other similar contrivances, except in the case of pipes or similar articles of extra length as compared with their diameter."

[Printed, 10d. Drawing.]

A.D. 1859, June 16.—N<sup>o</sup> 1454.

NEWTON, ALFRED VINCENT.—(A communication from Freeborn Adams.)—This invention relates to casting cylinders and tubes,

and consists in the employment for the purpose of a rotating vertical mould, the object being to avoid "the blow holes" and similar imperfections to which castings made in the ordinary manner are liable. The mould fitted with a central core is so "arranged that it may be rotated upon its axis, as the melted metal is poured in, by which the latter is caused to run into the mould around every side and no considerable disturbance of the mass of the metal in the mould is occasioned. The mould is formed of two halves, held together by clamps, and secured by pins to a bed, which is mounted on the top of a rotating shaft. Within the mould is a moveable bottom, which may be raised or lowered according to the length of tube or cylinder required, and upon this bottom rests the core, the upper end of which is steadied and held in place by metallic straps, made so thin as not to break the stream or interrupt the regular distribution of the metal as it descends into the mould. The core bar is made hollow, and perforated with holes, and when used it is to be covered with a coating of moulding sand, through which the gas and steam pass to the interior of the bar."

[Printed, 6d. Drawing.]

A.D. 1859, June 21.—No 1493.

PARKES, ALEXANDER.—This invention relates to the manufacture of cylinders and tubes of copper and copper alloys.

"Heretofore when raising discs or blanks of copper or alloys of copper by what is technically called 'drawing them through dies,' particularly when such discs or blanks were of considerable thickness, the metal was liable to be rendered thin in the parts which pass first through the die, and to remain comparatively thick at the edges which pass last through the die; for this reason, in place of using discs or blanks of uniform thickness, that is, with parallel sides, the discs or blanks are made less in thickness from the centre outwards, and by preference plain on one side and convex on the other; the raising is then performed in the ordinary manner, the punch die acting by preference on the plain side."

"When cylinders or tubes are made by bending sheets of copper or alloy of copper, in place of joining the edges by solder, the cylinders or tubes are heated in a suitable furnace

“ or apparatus to a high degree of heat, short however of the melting point of the metal, and then the butting or lapping edges are caused to melt or run together by jets of gas flame actuated by pressure and blast.”

“ In order to increase the length and decrease the diameter of a tube or cylinder of copper or of an alloy of copper, a mandril of somewhat less diameter than the interior of the tube or cylinder is used, and of such length that its end may come just at the pinch of the grooved rollers by which pressure is to be applied. Provision is made for holding the back end of the mandril, in order that the tube or cylinder which is placed on the mandril may alone be moved off the mandril by the grooved rollers. By this arrangement the cylinder or tube will, as it comes up to the pinch of the rolls, be compressed to fit the internal mandril, and will be rolled out to a greater length, and this process is to be repeated again and again till the desired diameter is obtained, a mandril of a less and less diameter being from time to time used.”

Making short cylinders or tubes by punching out the central portion of a block of copper which does not fill the die, but is expanded to the full size by the operation.

Drawing out cylinders and tubes from cylindrical blocks grooved externally, the object being to reduce the friction in the early parts of the process; the blocks are placed on a mandril and either drawn through holes or grooved rollers. The same result may be obtained by making the form of the holes or grooves in the rollers hexagonal, or otherwise than circular or segments of circles. Between the successive drawing or passing, the metal is annealed as often as required.

Forming or producing several tubes from copper blocks perforated with a parallel series of holes; these blocks, after being flattened and extended by rolling, are cut into strips, each strip embracing one of the holes; the strips are then severally opened out and formed into tubes.

Making of copper, or alloys of copper, printing rollers which fit a mandril that tapers gradually from each end to the centre, where it is made to separate, the mandril on which the rollers are made being also in two parts, each having the same tapering form to the ends, which when united form its mid-length.

[Printed, 4d. No Drawings.]



A.D. 1859, June 29.—N° 1546.

WIGHT, THOMAS.—This invention relates to core bars, spindles, and the chaplets employed in the manufacture of cast metal pipes and other articles.

The core bars are constructed in longitudinal sections, which are relatively capable of lateral expansion, so as to produce adjustable foundations for making cores of different diameters, according to the required size of the bore or cavity in the casting or pipe. The adjustable segmental and other sections of the core bar are laid upon a central spindle, and they are caused to expand by means of coniform enlargements on the spindle acting against inclines on the several sections when the spindle is moved endwise by means of a nut, the end of the spindle being screw-threaded. After the foundation sections are adjusted to produce a core of the desired size, the loam is then plastered upon them externally, and by the usual appliances employed for the purpose, the core is reduced to size and then dried in an oven previous to use. No haybands or similar packings to support the loam are required. Several modifications of this part of the invention are described and illustrated.

The chaplets are screw-threaded externally. They are for supporting or holding down the core in the moulds; they extend when placed in position from the surface of the core across the cavity to the walls of the moulds, and being screw-threaded a more perfect cohesion or union of the cast metal and chaplet (which becomes embedded and partly fused by contact with the molten metal) is effected, and in the case of nail chaplets, they are, when screw-threaded, more firmly held in the cast metal.

[Printed, 1s. 4d. Drawings.]

A.D. 1859, August 1.—N° 1780.

NEWTON, WILLIAM EDWARD.—(*A communication from Reiner Daelen.*)—(*Provisional protection only.*)—This invention relates to the manufacture of wrought-iron tubular cylinders adapted to the construction of steam boilers, thereby gaining strength and durability, whilst all the longitudinal seams made by rivetting bent plates end to end together, are avoided. The process is described as follows:—"A small cylindrical pile of iron  
" is first produced and hung upon a shaft or mandril having  
" a somewhat smaller diameter than the interior of the pile.

“ Above this shaft and set at right angles thereto is mounted a  
“ roller (which is cylindrico-concave longitudinally), this roller  
“ being adjustable vertically so as to be capable of being brought  
“ down with any required degree of pressure upon the metal to  
“ be operated upon. The shaft or mandril upon which the metal  
“ pile to be operated upon is hung, has an endway reciprocating  
“ movement imparted to it by a suitable arrangement of ma-  
“ chinery, it will therefore be understood that by this motion the  
“ metal will be subjected throughout its length to the laminating  
“ action of the roller above, and will thereby be rolled to the  
“ required degree of thinness, thus consequently producing a  
“ cylinder of any required size. In order to bring all parts of  
“ the circumference of the metal successively under the action of  
“ the laminating roller, the shaft or mandril upon which it is  
“ mounted may be rotated to the extent required at every traverse  
“ of the roller, or at any other desired interval by means of a  
“ hand wheel or any other suitable contrivance.”

[Printed, 4d. No Drawings.]

A.D. 1859, August 10.—N° 1854.

SPEED, JOHN JAMES, the younger.—This invention consists (as described by the inventor) “ in manufacturing pipes, tubes, and  
“ hollow cylinders of a combination of sheet metal and wire or  
“ strips of metal, and a soldering flux of zinc or other suitable  
“ metal in manner following:—I first form a tube by bending  
“ round sheet metal, and overlapping and uniting the edges by  
“ rivets or otherwise. This sheet metal may be galvanized on  
“ one or both sides, or may be coated with any desired metal or  
“ metallic alloy; I then wind round the sheet metal tube spirally,  
“ wires or strips, or bands of metal, and unite the whole by  
“ placing the partially finished pipe or cylinder in a bath of  
“ molten metal, and employing a flux to cause adhesion; I  
“ make the pipe revolve in the bath until a sufficient coating has  
“ been deposited on or become affixed to it. I withdraw and  
“ repeat the coating operation as often as may be necessary to  
“ secure the thickness of coating desired. For some purposes I  
“ wind on more than one spiral layer; and, according to the  
“ purposes for which the finished article is intended, I use  
“ various thicknesses of sheet metal and wire of different gauges.  
“ For water pipes I coat the interior with zinc, or use that metal

" as the core, and for gas, I coat the interior with lead or use  
" sheet lead for the core."

[Printed, 4d. No Drawings.]

A.D. 1859, August 22.—N° 1920.

PARKES, HENRY.—This invention relates to the manufacture of copper rollers adapted to the use of calico printers, either from worn-out copper rollers, or from similar rollers which may or may not have been used for other purposes. These rollers are first annealed and then, whilst at a red heat, passed between rollers longitudinally and flattened, or when intended to be made into rollers larger in diameter than their original size, they are cross rolled, and when the desired size is attained, the flattened metallic tube whilst in a heated state is opened by either pressing on the edges, drawing through dies, or by means of suitable mandrils, the annealing process being repeated as often as required. By this means the metal is again made to assume the form of a cylinder, which is finished in the usual way, by drawing through a circular die or draw plate. In this way copper shells are produced, which when mounted on iron liners or foundations, are suitable for receiving the engraved designs of calico printers.

Another mode consists in producing such copper shells from ingots, which may be either cast cylindrical and flattened, or cast flat with a slit through them, so that after the alternate annealing and rolling processes they shall open out to the required cylindrical form; these shells are, as a finishing process, also drawn through dies or draw plates, the shell being supported during the process internally by a suitable mandril.

The mandril employed instead of being made of steel and parallel throughout its whole length, consists of a cylindrical steel head of the required size attached to the end of a wrought-iron shank of smaller diameter. The size of the steel mandril head determines the internal size of the shell or roller; its extreme end, projecting through the hole in the draw-plate, is held in that position by attaching the shank end rigidly to the frame of the draw-bench or apparatus.

Describes a mode of casting the foundation body or lining of copper shells adapted to the use of calico printers.

" When making cylinders or tubes with bevil joints of sheet  
" copper or alloys of copper, the requisite bevil is given to the  
" edges, by drawing the plates of metal through dies, so as to



" produce the bevil required by pressure; or the bevil may be made  
" by rolling the edges down."

[Printed, 4d. No Drawings.]

A.D. 1859, September 3.—N° 2021.

LAUTH, BERNARD. — This invention relates to a mode of finishing tubes of brass or copper, such as the tubes or rollers of copper adapted to the use of calico printers, and tubes employed for other purposes, by a process of rolling, the invention being designed to supersede the usual mode of turning and finishing the surface of such rollers externally by the use of a lathe. The rollers employed are circumferentially grooved in pairs, the grooves being somewhat less than half a circle, and the effect on the copper or brass tube or roller is produced by a succession of passes, the tube or roller at each successive pass between the grooved rollers being slightly turned; the grooves in the two rollers are at intervals during the process, by means of screws operating on the two brass journals which receive and embrace the two ends respectively of the axis of one of the rollers, brought gradually together, until the grooves of each pair relatively form segmental portions of a perfect circle. The tubes or rollers to be operated upon are placed and fixed upon a mandril attached to a draw chain that laps round a wheel or pulley fixed upon a shaft which is set in motion by the motive power, the grooved rollers being set in motion by the frictional pressure with which they impinge upon the tube or roller as it is drawn between them.

[Printed, 10d. Drawing.]

A.D. 1859, October 4.—N° 2240.

MENNONS, MARC ANTOINE FRANÇOIS. — (*A communication from Louis J. Marie.*) — (*Provisional protection only.*) — This invention relates to a coupling joint, designed for connecting the ends of tubes of soft metal and other yielding substances. This joint as stated by the patentee " is formed of a tubular cone in metal, glass, or other matter, threaded at the base on the outside. " The extremity of the tube to be adapted being slightly opened " out or widened, is passed over this cone; a second conical " piece is in its turn passed over the tube and pressed home at " the widened end, and the whole is secured by a tapped nut or " ferrule, which passing over all is firmly screwed down on the



“ thread at the base of the inner cone. It is needless to observe  
“ that these joints may be made with any required number of  
“ branches or ways, according to the purposes for which they are  
“ intended.

[Printed, 4d. No Drawings.]

A.D. 1859, October 22.—N° 2416.

FOX, WILLIAM, and WILLIS, JAMES.—This invention relates to the manufacture of umbrellas and parasols and consists in :—

1st. Forming the stems or sticks of thin steel plates, which are severally cut into ribbons or pieces of the required width and length; these pieces in a heated state are, for the purpose of bringing them into a tubular form, passed through a draw plate; after the seam has been soldered, they are again heated, and then for the purpose of hardening the metal, they are taken and plunged into oil, care being required that the solder neither melts nor burns. They are afterwards strengthened and tempered by Fox's patent process, as described in his specification dated November 19, 1856, No. 2741.

2nd. Adapting such thin steel tubes as are cut, drawn, and soldered, and afterwards hardened and tempered, for use as walking sticks.

3rd. Relates to the mode of forming and fixing the ferrules on the ends.

4th. Several methods of fixing upon the tubular stems of umbrellas, &c. rings of metal, which afford hold for runner springs, whereby the umbrella or parasol may be kept either open or closed.

5th. Fixing the top notches on the tubular sticks or stems.

6th. Making the top notches and runners, the barrels whereof are made of thin steel, hardened and tempered after soldering.

7th. Covering the runners partially or otherwise with guards or shields.

8th. Making and employing ornamental metallic guards.

9th. Manufacturing runners and top notches out of metallic tube.

10th. Shaping the tips of the ribs, and coating them by an electro-plating or other process.

11th. Relates to the joints of folding sticks or stems.

12th. The mode adopted for attaching the handles.

[Printed, 8d. Drawing.]

" produce the bevil required by pressure ; or the bevil may be made  
 " by rolling the edges down."

[Printed, 4d. No Drawings.]

A.D. 1859, September 3.—N° 2021.

LAUTH, BERNARD. — This invention relates to a mode of finishing tubes of brass or copper, such as the tubes or rollers of copper adapted to the use of calico printers, and tubes employed for other purposes, by a process of rolling, the invention being designed to supersede the usual mode of turning and finishing the surface of such rollers externally by the use of a lathe. The rollers employed are circumferentially grooved in pairs, the grooves being somewhat less than half a circle, and the effect on the copper or brass tube or roller is produced by a succession of passes, the tube or roller at each successive pass between the grooved rollers being slightly turned ; the grooves in the two rollers are at intervals during the process, by means of screws operating on the two brass journals which receive and embrace the two ends respectively of the axis of one of the rollers, brought gradually together, until the grooves of each pair relatively form segmental portions of a perfect circle. The tubes or rollers to be operated upon are placed and fixed upon a mandril attached to a draw chain that laps round a wheel or pulley fixed upon a shaft which is set in motion by the motive power, the grooved rollers being set in motion by the frictional pressure with which they impinge upon the tube or roller as it is drawn between them.

[Printed, 10d. Drawing.]

A.D. 1859, October 4 .—N° 2240.

MENNONS, MARC ANTOINE FRANÇOIS.— (*A communication from Louis J. Marie.*)—(*Provisional protection only.*)—This invention relates to a coupling joint, designed for connecting the ends of tubes of soft metal and other yielding substances. This joint as stated by the patentee " is formed of a tubular cone in metal, glass, or other matter, threaded at the base on the outside. " The extremity of the tube to be adapted being slightly opened " out or widened, is passed over this cone ; a second conical piece is in its turn passed over the tube and pressed home at " the widened end, and the whole is secured by a tapped nut " ferrule, which passing over all is firmly screwed down

to reach entirely round the tube, or if they do, then the depth of the indent must vary, so as to be greater on one side of the tube than on the other. The inventor says "in constructing such depressions I use a mandril divided longitudinally into several parts, which, when correctly together, will fit or nearly fit the interior of the tube for a short part of its length. Around part of the surface of such mandril a groove is formed in a direction transversely of the central axis of the tube and of the mandril, such groove corresponding with the depressions desired to be made in the tube, and into this groove the metal of the tube is to be depressed. The mandril is then to be moved into the part of the tube next to be operated on, which may readily be done by reason of the mandril being made of several parts; and when the parts of the mandril have been again brought together so as to fill or nearly to fill the interior of the tube, the next depression is then to be made, and so on, till all the depressions have been made in a tube."

[Printed, 1s. 10d. Drawings.]

A.D. 1859, December 6.—N<sup>o</sup> 2764.

POTTS, FERDINAND.—This invention relates to the finishing processes of metallic tubes :—

Boiler tubes made of brass or "Muntz's Metal" are, when intended to be used with water known to act injuriously upon the metal, coated with copper, which is to be deposited by any of the known methods of electro-plating, such tubes being afterwards drawn through steel dies or plates for the purpose of hardening and condensing the metallic particles.

Iron tubes are also treated in the same manner for the purpose of protecting their surface from oxidation. After all oily and unctuous matter has been removed, they are submerged in a bath of properly diluted sulphuric acid, which has the effect of cleaning off their surfaces all scale or oxide; they are then electro-coated with copper and drawn through a plate or die, which it is stated is found to increase their hardness, rigidity, and strength. These electro-coated iron tubes are adapted for use in steam boilers, surface condensers, hand railing, and other purposes.

[Printed, 4d. No Drawings.]

A.D. 1859, December 24.—N<sup>o</sup> 2935.

GEYELIN, GEORGE KENNEDY.—(*Provisional protection only.*)

This invention, relating to the manufacture of twisted tubes

adapted for transparent columns, pillars, tubes, and a variety of other purposes, is described as follows:—"The metal, either solid or in tubes, is twisted in one or more threads round a mandril, which can then be withdrawn; the ends can be fixed to a plate either by soldering, casting, or otherwise, for ornamental and strengthening purposes; the centre part of the column, etc., can be fitted with a coloured glass tube or other materials, and the outside with a reversed thread; the same principle can be adopted for twisting glass."

[Printed, 4d. No Drawings.]

A.D. 1859, December 24.—N° 2941.

SMITH, EDWIN.—(*Provisional protection only.*)—This invention, relating to a mode of ornamenting or decorating metallic pipes and tubes, is adapted to the tubular parts of gas fittings and to other purposes where ornamental pipes and tubes may be advantageously employed. It consists in engraving or cutting ornamental designs on the external surface of tubes and pipes, by the aid of a self-acting screw-cutting lathe, or other similar mechanical contrivance.

[Printed, 4d. No Drawings.]

A.D. 1859, December 27.—N° 2950.

TRUSS, THOMAS SEAVILLE.—This is an invention of a combination of animal and vegetable fibrous substances, which, by chemical treatment, is made suitable for packing (in the form of rings and washers) the joints and connections between pipes, and also as a cushion under railway chairs, girders, engines, and other machines subject to jars or concussions. The fibrous substances consist of wool, cow-hair, and dogs' hair, hemp, flax, and cotton. These for the purpose of preserving and protecting them from the action of acids or gases, are first steeped in an alkaline solution made from soda and potash, and after being thoroughly saturated thereby, they are coated with hot or cold grease and pitch or tar, either alone or combined. Pressure may then be applied, and the mass when adapted as packing for the joints of pipes is cut or prepared in the form required.

[Printed, 4d. No Drawings.]

A.D. 1859, December 30.—N° 2992.

COCHRANE, HENRY.—This invention relates to the construction of core bars, which are externally formed of loam in a plastic



state on an expandible metallic foundation with a central axis, the ends whereof are prepared for introduction between the lathe centers, when the core bars are formed and turned to the required diameter. The expandible foundation of the core bar consists of a square or other polygonal formed tube to which are fitted, one on each side or surface, four or more longitudinal segmental sections, which are formed to overlap each other along the edge or side.

"At one end the sections are formed with a transverse groove on their exterior surfaces into which a circular disc is received, and through the centre of which the neck or axis at one end of the square tube passes. The other end of each section is formed with an internal projection or flange, which enters a groove formed around the screw nut; hence when the screw nut is turned the square tube will be moved from one end and towards the other end, according as the nut is turned in one direction or the other. The interior surface of each section is formed with internal longitudinal ribs, and the exterior surface of each of the sides of the square tube is formed with longitudinal ribs, and it is by means of these ribs that the interior tube is prevented turning. Inclines are formed on the interior of the sections, and on the exterior of the square tube, by which, when the latter is moved longitudinally within the sections of the cylinder, the sections of the cylinder will be expanded or allowed to come together according as the screw nut is moved in one direction or the other. When the core bar is in an expanded state it is coated with loam, and is used as a core in the ordinary manner. When the casting has been made thereon, the screw nut is to be turned in such manner as to allow the sections to come together."

[Printed, 10d. Drawing.]

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1860.

A.D. 1860, January 12.—Nº 91.

MOORE, PAUL, and MOORE, PAUL, the younger.—(*Provisional protection only.*)—This invention relates to the manufacture of dies or draw plates applicable to the process of drawing wire, tubes, and to similar purposes. It "consists in chill-casting dies

“ or draw-plates of iron or steel, with plugs or mandrils of the  
“ requisite gauges to form the holes inserted in the ingot or  
“ mould, the die or draw-plate is then chill-cast round these  
“ plugs, and thus, by withdrawing the plugs after the casting is  
“ made the holes are formed; by this process the inner surfaces  
“ of the holes are chilled. The holes being formed whilst the  
“ die is in a heated state and the plugs whether of iron or steel  
“ are accurately turned in a lathe before being used.”

[Printed, 4d. No Drawings.]

A.D. 1860, January 20.—N° 145.

MOORE, PAUL, and MOORE, PAUL, the younger.—(*Partly a communication from J. J. Eagleton.*)—The object of this invention is to improve the manufacture of the dies or draw plates employed in the process of drawing wire and tubes, and for similar purposes. It consists in producing hard and economical draw plates of iron or steel by a process of casting them of either of those metals, or of a mixture of both, in iron or steel chills or moulds; the holes or apertures through which the wire, tube, or article is drawn, being cast out at the same time, for which purpose, plugs or cores of iron or steel formed to the required size or gauge of the holes are placed in the mould, the parts of which are then, previous to pouring in the molten metal, bound together by clips. After the casting has had time to cool, the mould is opened and the metal cores or plugs, which are sticking through the plate, and with which the newly cast metal is in intimate contact, are then forced out of the plate or withdrawn. The plate is then ready for use, a hardened steel “rimer” being sometimes required after the casting process to smooth or to clean out the holes. The hardening of the rimer is effected by heating it to a red heat and then striking it into lead. These rimers are also used to re-adjust the holes.

[Printed, 8d. Drawing.]

A.D. 1860, February 7.—N° 329.

LEA, EDMUND.—This invention relates to combining the processes of preparing the metal hoops or strips, and bending them into the form of skelps for the manufacture of welded iron or steel tubes, without reheating the metal. The inventor says,  
“ after having made the iron or steel into strips or hoops by

“ rolling in the ordinary manner, I pass the said strips or hoops as they leave the hard or finishing rolls, and while they are are still hot, between rolls which bend them into skelps, which may afterwards be welded into tubes in the ordinary manner. Or the said strips or hoops may be made into skelps by other moulding or shaping machinery by which skelps are or may be made, the essence of my invention consisting in making the said skelps before the iron or steel has become cold after having been made into strips or hoops. By my invention the reheating of the strips or hoops of iron or steel to convert them into skelps or partially formed tubes, is avoided.”

[Printed, 4d. No Drawings.]

A.D. 1860, March 12.—N° 659.

HOWELL, JOSEPH BENNETT.—(*Provisional protection only.*)—The object of this invention, which relates to the manufacture of boiler tubes, is, first, to improve and equalize the draught through the tubes of multitubular and other steam boilers, so that the draught current shall not be greater direct through the center of the tube than it is along the sides, as is stated to be the case through the ordinary straight tubes, and, second, to increase the area of the heating surface. These results are to be attained by giving to the tubes severally “ a curvilinear undulating or also a helical screw-like shape, the tube being bent so as to form a screw thread of rather an elongated or quick pitch; I impart said improved shape to the tubes by means of male or female mandrils, dies, or swages, or by any other suitable mechanical means.”

[Printed, 4d. No Drawings.]

A.D. 1860, March 24.—N° 769.

MENNONS, MARC ANTOINE FRANÇOIS.—(*A communication from Frédéric Pierre Langenard.*)—This is an invention of a metallic packing adapted for closing or filling metallic joints, and “ consists in the substitution of leaden strips or wires covered with a thin sheeting of copper or brass to the minium and other cements generally employed for closing or filling the joints of certain parts of machinery, sections of tubing, and other detached pieces of metal. To this end the leaden strip or wire, with its copper or brass sheath, is interposed between

“ the parts to be joined, which are then tightened up by screws  
“ or other suitable means. The pressure thus exerted forces the  
“ lead, with its sheathing, into all the chinks or cavities which  
“ may be present, and forms a complete closing of the joint,  
“ while the exposed surfaces are protected from oxidation by the  
“ brass or copper sheeting with which they are covered.”

[Printed, 4d. No Drawings.]

A.D. 1860, April 5.—N° 869.

FULLER, JOHN HOBSON, and DAVIDSON, WILLIAM.—This invention relates to apparatus adapted for cutting off or dividing or for cutting screw threads on metallic pipes and round rods. The apparatus is a kind of screw stock, furnished with one die, which is fitted to slide in a longitudinal groove when moved by an annular nut, that engages with a screw thread externally cut on one handle, a similar nut on the other handle operating a cutter which is advanced thereby, the die pressing the tube between two inclining surfaces, so that whilst the cutter operates, the tube is trigonally held in position between three opposite points.

[Printed, 6d. Drawing.]

A.D. 1860, April 16.—N° 957.

CLARK, WILLIAM. — (*A communication from Messrs. Hugo Frédéric Forbes and Jean François Félix Challeton.*)—This invention, relating to the manufacture or process of twisting tubes, is applicable to, and includes the manufacture of, fire-arms generally, and the reduction by the twisting process of the size of old guns. The twisting apparatus consists of two double standards or headstocks, in each of which is mounted in suitable bearings a mandrel that carries on its projecting end a clipper chuck, and between the bearings a driving pulley. These standards are fixed upon a long horizontal bed, one at each end, the clip chuck of one mandril pointing in a direct line towards the clip chuck of the other. The ends of the tube or gun barrel being secured in the respective chucks, occupies the space between them. Mounted upon wheels which run in longitudinal grooves formed along the bed is a movable furnace, directly through the body of which the tube or the barrel, which is heated progressively *thereby*, is passed before its ends are secured in the clip chucks,



and the mandrils are caused to rotate in opposite directions by means of weights suspended by ropes which are wound relatively in opposite directions round the driving pulleys. One of the mandrils carries a handle on its outer end. The *modus operandi* depends in a measure on the nature of the tube and its intended use.

2nd. Breech-loading guns. This part of the invention is described with reference to 40 separate figures of details delineated on the drawing.

3rd. Muskets. Are described and represented by 17 figures of details.

4th. Pistols, described and represented by 18 figures.

5th. Projectiles for breech-loaders.

[Printed, 1s. 2d. Drawings.]

A.D. 1860, April 19.—N° 980.

LAUTH, BERNARD.—This is the invention of an apparatus adapted for straightening metal bars, tubes, rails, plates, and similar articles. It consists of two horizontal sets or series of rollers, mounted equidistant and relatively parallel in suitable side frames, and so disposed one series above the other, that the rollers of one set are respectively above the spaces which divide the rollers of the set beneath. All the rollers are circumferentially grooved alike, the grooves in each roller corresponding exactly with the grooves in all the rest, and both series are grooved to correspond, so that when the rollers are mounted, the grooves come relatively in an invariable line, the form of each line of grooves corresponding with the transverse form of the bar, tube, or rail which, when the lower series of rollers is set in motion by suitable gearing, are respectively passed through the line of grooves suited thereto, provision being made by means of screws for regulating the distance between the two series. When plates are flattened or straightened plain rollers are employed.

[Printed, 6d. Drawing.]

A.D. 1860, May 7.—N° 1134.

JOHNSON, JOHN HENRY.—(*A communication from Messieurs Button and Blake.*)—This is an invention of a screw union or coupling, adapted more particularly as a means for connecting the hose pipes of fire-engines, and whereby it is stated "an extra

“ length of pipe may be coupled on to the hose without necessitating the shutting off or stoppage of the flow of water through such pipe.”

It is proposed so to construct the couplings that a tight junction may be effected by two combined movements, the first to connect the two parts by a sliding movement in a lateral or transverse direction to the line of piping, and secondly, setting up or forcing the same parts tightly together by an endwise or longitudinal movement of the parts, employing for that purpose screws, wedges, cams, levers, or other mechanical equivalents, either separately or combined.” The lateral movement locks the two parts of the coupling one to the other, and the subsequent longitudinal movement of the screw-threaded collar forces what is called a “swivel collar” against a rim on the end of a part of the coupling of one pipe, and causes it to press upon an annular packing or washer disposed in a recess formed in the end or part of the coupling which is upon the other pipe, the parts being moved round by folding handles attached, instead of by a loose spanner, such as is usually employed.

A mode of attaching a nozzle to a pipe by similar contrivances is described, and also a modification or “simple mode of setting up the coupling joint by two movements.”

[Printed, 8d. Drawing.]

A.D. 1860, May 23.—N° 1282.

DE BOUSSOIS, FRANÇOIS JOSEPH EDOUARD DUCLOS.—(*Provisional protection only.*)—“This invention relates to an improved system or mode of manufacturing tubular metal articles, such, for example, as hollow axles, shafts, gun barrels, and masts, and consists essentially in the substitution of cast steel for wrought iron in such manufacture. In making a hollow axle or tube according to this invention, it is proposed to prepare a block of cast steel of an annular form, the weight and dimensions of which are proportioned to the weight and dimensions of the hollow cast steel axle or other article to be produced. This cast steel ring, having been heated to a welding heat, is placed on a mandril, and rolled thereon between a pair of rolls, according to the manner described in the Specifications of Mr. James Edward McConnell’s Letters Patent, of the 28th August 1851, No. 13,729, and the 24th June 1852, No. 14,182.”

[Printed, 4d. No Drawings.]

A.D. 1860, May 31.—N° 1344.

KINNIBURGH, JOHN.—This invention relates to the casting of metal pipes and tubular articles in heated metallic moulds, and to the construction of the moulds employed, the sections or parts of which are relatively capable of expansion, the cores employed being made in the usual manner out of the materials generally used for the purpose.

The moulds may be made in one piece capable of expansion, but moulds comprising two halves or longitudinal sections are preferred. These moulds are to be made either true and smooth inside or otherwise, according to the nature and required finish of the casting, their interior being coated with "blackening" or other suitable material. When the two halves of the mould are placed together, they are embraced by rings which are slid on, and they are kept in position by wedges of suitable material forced in between the exterior of the mould and the rings, so as to keep the two sections together, and yet permit of their expansion; instead of rings, clamps or screws may be used for the purpose.

When moulds are made in one piece, it is by preference made of cast iron in the form of a tube longitudinally slit from end to end, the edges when prepared to receive the casting being closed by rings which will admit of expansion, such metallic mould, whether composed of one piece or of two or more sections, requiring to be heated previous to use, in order to prevent the too sudden chilling of the metal.

[Printed, 4d. No Drawings.]

A.D. 1860, June 5.—N° 1371.

TAYLOR, WILLIAM.—(*Provisional protection only.*)—This invention relates to the manufacture of metallic pipes adapted for heating conservatories, buildings, and similar purposes. These pipes are to be made in suitable lengths out of galvanized iron, copper, or other malleable material. Instead of being made cylindrical, they are, in order to increase their power of radiation, formed flat and shallow, "either with single or double passages through them, "and to be connected together by piping suitable for the purpose. "This description of piping is adapted to greatly economize fuel "and time in heating or increasing the heat, as the water, steam, "or other heating property used is much less in bulk than that "which is now in general use, and possesses the means of a much

“ greater power of heating by presenting a larger surface of heated metal.”

The inventor “ also claims the method of manufacturing such pipes and connections, by using sheet galvanized iron, zinc, copper, or any other suitable metal bent round suitable shaped mandril and double lapping, then rivetting them up.”

[Printed, 4d. No Drawings.]

A.D. 1860, June 25.—N° 1538.

**BARNSELY, ABRAHAM.**—(*Letters Patent void for want of Final Specification.*)—This invention, relating to the apparatus employed and to the manufacture of welded iron tubes, consists in employing for the preparatory processes a double draw bench furnished with two sets of draw-chains, stops, and wagons appropriately fixed directly opposite a welding furnace having two apertures. The advantages to be derived from the use of the invention are stated by the inventor as follows :—“ By the action of my double draw bench, two tubes are made to undergo the process of welding simultaneously. Each tube, after travelling over the first division of such double draw bench, is passed on to the second division of such double draw bench, and from such second division to the single draw bench in the rear. Thus during the finishing of the welding of a tube on the single draw bench, two tubes are undergoing consecutively the preparatory processes of welding on the double draw bench. The single draw bench placed in the rear of the double draw bench is thus kept in full action, and the tubes escape much unnecessary heating, and are improved in quality.”

Printed, 4d. No Drawings.]

A.D. 1860, June 25.—N° 1544.

**HIGGINBOTTOM, WILLIAM.**—(*Provisional protection only.*)—This invention relates to a simple form of joint adapted for connecting such metal or earthenware pipes as are intended for the conveyance of water, gas, or drainage; also to the construction of sluice valves and hydrants, to be used in connection therewith. Instead of casting or forming in the ordinary way a socket on one end of the pipe, both ends of the pipe are made plain, and the connection is made by means of a “ loose socket composed of metal or earthenware, and having a cavity inside, into which is



“ forced by hydrostatic or other powerful pressure a suitable cement which surrounds the joint, and when hard renders it perfectly water-tight, and strengthens the pipes at that part. The shells of the valves and hydrants are made of earthenware in lieu of cast iron, and the valve facings are fitted into their places by the same process described in reference to the pipe joints, that is to say, by forcing cement round the valve facings after they have been placed in their proper positions. By the use of the peculiar pipe joint above referred to with earthenware pipes, and the earthenware valve casings and hydrants, a great saving of water is obtained, as the water being kept purer, the necessity for running off or cleansing the mains is obviated, whilst the cost of material is considerably reduced.”

[Printed, 4d. No Drawings.]

A.D. 1860, June 26.—N° 1552.

BARNSELY, JABEZ ELUL.—(*Provisional protection only.*)—The object of this invention, relating to the manufacture of iron tubes, is to improve the process of shaping the skelps and welding the seams, which process has hitherto been effected by two operations, each requiring a separate draw bench. It consists in employing, for the purpose of forming and welding such tubes, a “double or compound draw bench, by which two tubes are drawn at the same time, that is, one tube is undergoing its first drawing, and another tube is undergoing its second drawing simultaneously. The skelps are placed in the furnace side by side in the ordinary manner, and each skelp as it is brought to the required heat opposite one side of the draw bench is withdrawn, and operated upon by the said draw bench. It is then returned to the furnace opposite to the other side of the draw bench, and is subjected to a second drawing simultaneously with the first drawing of another tube. The wagon by which the ends of the partially formed tubes are seized in the drawing process consists essentially of two levers turning upon separate centres, which said levers, on the application of the chain by which the drawing is effected, are made to grasp the two partially formed tubes between their ends and fixed pieces on the body of the wagon.”

[Printed, 4d. No Drawings.]

A.D. 1860, July 14.—N° 1702.

MILLER, THOMAS WILLIAM.—(*Provisional protection only.*)—This invention relates to the employment in the construction of steam boilers and condensers of spirally screwed or twisted tubes for the purpose, when a current of water, vapour, or gaseous products, as the case may be, passes through such tubes, it may be caused to rotate, roll over, and be carried forward circulatingly, the same effect being produced on the motion of the fluid, which is impinging on them externally. The ends of the tubes may either be left plain for insertion into circular holes in the tube plates, or they may be spirally screwed throughout their whole length, and the holes in the tube plates be correspondingly prepared by means of suitable cutters to receive them.

“The desired form or character may be given to the tubes by pressure in dies, or by drawing and pressure combined between ‘part dies’ or stocks containing the expanding pieces by which the form is given, or any other well-known means may be employed for producing tubes of the requisite form or shape, capable of withstanding great pressure applied either internally or externally.”

[Printed, 4d. No Drawings.]

A.D. 1860, July 21.—N° 1774.

NORMANDY, ALPHONSE RENÉ LE MIRE.—The object of this invention is to improve the mode of connecting gas and other pipes. It is described by the inventor as follows:—

“The pipes to which I apply my improved joint I make plain from end to end, that is to say, without sockets, and when two such pipes are laid end to end, I slip over them to the point, where the ends meet or come opposite each other, a short cylinder of slightly larger diameter than the pipes to be connected. This short cylinder is made at its two ends with sockets or recesses of larger diameter than the other parts of the cylinder; and it has also flanges at its ends. Into the sockets or recesses rings of vulcanized india-rubber or other suitable packings are introduced, and over these, filling pieces or rings of metal are placed, which enter the sockets or recesses. These filling pieces are furnished with flanges, by means of which the said pieces are forced down upon the packing, screw

“ bolts being employed to draw the flanges on the filling pieces  
“ up to the flanges on the cylinder; other means may be em-  
“ ployed for forcing the filling pieces or rings on to the packing,  
“ or other means of expanding the packing and pressing it firmly  
“ in contact both with the pipes and the covering cylinder may  
“ be resorted to.”

According to a modification, the rings and filling pieces are formed on the short cylinder, and the sockets on the other part.

[Printed, 8d. Drawing.]

A.D. 1860, August 15.—N° 1980.

GREEN, CHARLES, and ASBURY, WILLIAM.—The object of this invention, relating to the manufacture of boiler tubes, consists by a supplementary operation, in imparting to ordinary tubes externally a spiral or helical form, which is effected by the pressure of the edged periphery of a revolving disc roller or tool. The tube to be operated upon having a plug in each end, is mounted to revolve in a lathe, and the pressing tool is fixed in the tool holder, which is mounted on a slide rest, that is caused to traverse the lathe bed at a speed fixed in relation to a given number of revolutions of the lathe mandril and pipe. The edge of the revolving pressing tool is caused to indent the tube helically by the traversing motion of the slide rest whilst the tube revolves, the inclination of the indent in relation to the axis of the tube, being regulated by the speed or longitudinal distance which the slide rest moves whilst the mandril and tube make a certain number of revolutions. A part of the slide rest projects in the direct line between the lathe centers, and is bored through concentrically therewith to receive the tube, which slides through the hole when the slide rest is in motion, and the tube is thereby supported against the pressure of the tool.

[Printed, 10d. Drawing.]

A.D. 1860, September 3.—N° 2127.

JOHNSON, JOHN HENRY.—(*A communication from Homer Parmelee.*)—(*Provisional protection only.*)—“ This invention  
“ relates to a peculiar system or mode of compressing the sand  
“ employed in the manufacture of moulds and cores for the  
“ casting of pipes and other cylindrical articles, whereby a greater  
“ uniformity in the density of the sand in the mould box is  
“ obtained, and a considerable economy of time effected.”

## METALLIC PIPES AND TUBES.

It is proposed to employ a cylinder having near its lower end a spiral or inclined flange, the whole revolving in a cylindrical chamber. This revolving cylinder with its spiral flange or flanges draws down the sand or material into the chamber, and as its revolving motion continues more sand or material is deposited in the chamber, and it gradually rises as it continues to compress the sand or material beneath its spiral flange or flanges to a density depending upon the weight of the cylinder and flanges."

When used for making moulds for pipes, the pattern which covers the interior of the mould may serve as a guide to the revolving cylinder, which fits over and revolves round it, or the pattern may be dispensed with, and a circular block fitted loosely to the bottom of the cylinder below the spiral flange or flanges so as not to rotate therewith, the diameter of such block being equal to the inner diameter of the mould, or the same effect may be obtained by simply extending the cylinder a short distance below the flange or flanges."

"In making pipe cores the process is precisely similar, but in this case the cylindrical chamber must be of the desired diameter of the core."

[Printed, 4*l*. No Drawings.]

A.D. 1860, September 5.—N° 2138.

STEWART, DAVID YOOLOW.—This invention relates to the construction of moulds adapted to the casting of iron. These moulds are made in sections so arranged that not only a succession of castings may be taken, but more or less chilling of the metal is produced.

According to one modification, the moulding sand or material is held in the interstices formed between a series of metal ribs or projections, the respective surfaces of which may come into contact with the model or nearly so whilst the mould is being formed so that afterwards when the metal is poured in, a chilling effect is produced upon it by the contiguity of the surfaces of the cold ribs or metallic projections, which are fixed in the moulding boxes, and more or less embedded in the moulding sand.

According to another mode of construction, the mould may be built up of sections, each comprising a series of metal projecting parts, the interspaces between which are to be filled with the moulding sand to permit of contraction. The projections or



ribs may be variously disposed so as to place them nearly contiguous to the model, more or less of the sand being interposed between them and the model, according to the amount of chill required. The projecting ribs or metallic pieces which are thus embedded in the sand, may be variously arranged and fixed in the moulding boxes, in a manner most suitable for bringing their projecting surfaces to correspond with the configuration of the model.

The core bar employed to form the bore of cast metal pipes, consists of two pairs of longitudinal segments ribbed on their outer surfaces, and connected by links to a central bar; by this means the core bar is rendered expansible, the loam or sand being filled in between the ribs, is afterwards shaped externally by scrapers or otherwise.

[Printed, 10d. Drawing.]

A.D. 1860, September 21.—N° 2305.

MARTIN, THOMAS.—(*Provisional protection only.*)—This invention relating to a mode of connecting and disconnecting tubes and pipes, in a manner said to be steam, air, or water-tight, “consists in the application and use of an annular wedge, the exterior surface being formed of two inclined planes straight or curved, and both tapering from the centre of its length; such wedge is placed in the interior of the extremities of the pipes to be coupled, which are tapered internally to receive the wedge-shaped ring or packing. The ring may either be solid or disunited at one point of its circumference, so as to allow it to spring slightly, so that when the pipes to be connected are bolted together at the flanches, as usual, the double conical or curved exterior of the packing ring is brought into close contact with the interior bevelled surfaces of the pipes, and by the compression of the ring, by means of the bolts, it is caused to fit and form a perfectly tight joint at the junction of the pipes. Such rings may be made of any description of metal, wood, or preparations or combination of caoutchouc, gutta-percha, or other material, which may be considered most appropriate to the purposes for which they may be used.”

[Printed, 4d. No Drawings.]

A.D. 1860, October 15.—N° 2511.

NEWTON, WILLIAM EDWARD.—(*A communication from Felix Richard.*)—The object of this invention is to improve and adapt

tools or machines to the manufacture of certain kinds of metallic tubes, and more particularly such as are employed in the construction of "Bourdon's barometers," and pressure and vacuum gauges. These tubes are somewhat flattened, and in transverse section present the appearance of two arcs of circles, respectively intersecting each other at an acute angle, such tube being longitudinally bent to the required curve. During the manufacture of these tubes they pass through a series of processes, consisting of:—

1st. Flattening the tube and curving it into a semi-circular form. The metal of the tube is sufficiently thin, that when the mandril, which is somewhat wider than the diameter of the tube, is introduced, the tube takes an oval form; it is then, being placed between two wooden formers, submitted to the pressure of a screw press and flattened to the shape of the mandril, which is afterwards withdrawn, and two flexible blades of steel are introduced for the purpose whilst the tube is being bent by passing it between rollers and a wooden block, of keeping the angles or sides apart, one end of the tube being fixed to the roller.

2nd. This and the other stages of the process consist in setting the tube on a curved mandril, and after passing it through a laminating apparatus, submitting it to a burnishing or rubbing process, in order to impart to it the greatest possible degree of elasticity, the tube whilst operated upon being kept on the mandril, is mounted on a lathe plate, to which an intermittent rotary motion is imparted.

The pressure of the burnishing tools, which are regulated by a screw, shapes, polishes, and hardens the metal, both the inner and the outer curved surface of the tube being subjected to the operation.

Describes an apparatus employed for polishing the burnishing tools and keeping them in proper condition, which is essential to the success of the operation.

[Printed, 1s. 6d. Drawings.]

A.D. 1860, October 26.—N<sup>o</sup> 2616.

BROOMAN, RICHARD ARCHIBALD.—(*A communication from Athalis Delaporte.*)—(*Provisional protection only.*)—This invention, relating to a mode of uniting pipes and tubes, is effected "by means of a collar free to slide along the tubes, and so formed as after being brought over the abutting ends of any two pipes required to be joined, to leave a space between the inner sur-

“ face of the collar and the pipes. The collar is made with an aperture for the purpose of pouring in a mastic or cement, which on setting together with the collar forms a hermetic joint. The pipes are formed by preference with annular grooves at their ends for giving a better hold to the mastic; or the ends of the pipes may be made with tongues or projections which enter grooves in the sliding collar, the joint being made tight by cement or mastic applied in a heated or cold state. In some cases the grooves are formed to permit of the collar being turned more or less to force the ends of the pipes together. Again, sheets or rings of india-rubber may be placed over the ends of the two pipes to be joined, wrapped with wire or cord, and then covered by the sliding collar, mastic or cement being used at the ends of the collar.”

[Printed, 4d. No Drawings.]

A.D. 1860, November 3.—N<sup>o</sup> 2703.

MITCHELL, JOSEPH.—This invention, relating to the process of casting pipes, tubes, pillars, and similar articles, refers to the moulding boxes, the construction of the core bar, appliances for securing the core within the mould, and to the mode of forming the model, and introducing and withdrawing it from the moulding boxes.

The moulding boxes are formed “ perfectly even and smooth on their edges, having their ends bored true, so that when put together the aperture accurately fits the extremities of the core bar, like a piston rod passing through the cover of a cylinder. The core bar has also those portions of its extremities which pass through the box ends accurately turned, and smooth; one of the projecting ends has a collar formed on it, which presses against the outer face of the end of the boxes; the other extremity has a neck and shoulder on it, the latter of which lies within the box, the neck passing outwards. When the bar is placed within the boxes, it is firmly and tightly held in its place by means of a cottar driven through the projecting end, which pressing against a ring or collar on the end of the box, draws up the collar at the opposite extremity close against the end of the box, and tightens it; the boxes are themselves held together by clamps.”

It consists as regards the model, in using a table or gantry which is mounted on wheels and has a perfectly smooth sur-



face. "The face of the gantry is made to fit the model, which  
 "is placed within it and supported on cottars or bars. The  
 "extremities of the model are supported on rods or bars, which  
 "by means of other transmitting rods are connected with a  
 "balance lever, by depressing or elevating which the model is  
 "raised or lowered. In using these appliances the model is  
 "first placed within the prepared recess in the face of the gantry  
 "and by means of the supporting bars rapidly seated; the one  
 "box is now placed on the gantry over the model, and the  
 "sand rammed firmly in and around it, the supporting bars  
 "being withdrawn the model rests upon the vertical rods con-  
 "nected with the balanced lever, the latter being acted upon  
 "the system is depressed and bears with it the model from  
 "out of the mould. The same is repeated with the other box,  
 "the core bar is then placed within these boxes and fixed as  
 "before described."

[Printed, 10d. Drawing.]

A.D. 1860, November 10.—N<sup>o</sup> 2768.

WILSON, EDWARD BROWN. — This invention is concisely described by the inventor as follows: — "My said invention  
 "relates to the manufacture of railway wheels, tyres, axles, and  
 "points, and crossings, also ordnance, gun barrels, tubes, and  
 "metal cylinders generally, and consists in shaping and com-  
 "pressing such articles after they have been cast or forged, by  
 "the aid of suitable dies acted upon by hydrostatic pressure."

[Printed, 4d. No Drawings.]

A.D. 1860, November 16.—N<sup>o</sup> 2821.

BROOMAN, RICHARD ARCHIBALD.—(*A communication from Louis Alexandre Farjon.*)—This invention relates to various contrivances for joining or connecting pipes or tubes.

Describes a mode of junction suitable for steam or water pipes. The ends of the pipes are first widened or enlarged by a mandril or suitable tool, and, fitting into the enlarged ends of the two pipes which are to be connected, is a double incline metal ring. Externally on the end of one pipe there is, shaped to embrace the enlarged end, a ring with a projecting part, and on the other pipe a similar ring with a hooked part, and when the pipe ends are



brought together, and an india-rubber ring placed between them, the parts of each ring engage and draw the two pipes together.

An arrangement of a joint in which a collar formed on one of the pipes is abutted against by a notched ring, a tube carrying an india-rubber ring being screwed into the pipe. The end of the other pipe carries a collar which is forced over the india-rubber, and engaging with the notches in the ring forms the junction.

According to another arrangement the connection is made by a ring of soft metal, covered by a notched collar on the end of each pipe.

Another mode of junction employs an india-rubber ring to cover the junction of the two pipes, the respective ends of which are each furnished with a soft metal ring; these rings press on each side of the india-rubber, and they are secured by a loose collar on one pipe engaging with a fast collar on the other.

Other contrivances and modifications of the above and similar modes of connecting pipes are also described and illustrated.

[Printed, 8d. Drawing.]

A.D. 1860, November 24.—N° 2885.

WALKER, SAMUEL, the younger.—This invention relates to a machine or apparatus adapted by means of pressing tools, to the ornamentation of either straight or tapering metal tubes. The effect is produced by indentation, either in straight lines after the style of reeds or flutes, for which purpose the tube during the process is merely drawn lengthwise through the machine between the pressing tools; but when spiral, twisted or diamond effects are to be produced, to the tube whilst it is drawn longitudinally through the machine or to the apparatus which holds the pressing tools, a rotary movement is imparted, the speed respectively to each motion being relatively timed. The pressing tools are disposed in radial positions in the tool holder, and pointing towards a common center through which the tube is drawn, are when operating on tapering tubes, caused by means of screws to converge or diverge simultaneously, at the same rate that the diameter of the tapering tube either increases or diminishes as it passes in one or other direction through the apparatus; the outer end of each screw carries a star wheel, all of which engage with and are set in motion by a kind of peg wheel. The metal tubes are manufactured by any of the ordinary processes.

[Printed, 8d. Drawing.]

A.D. 1860, November 30.—N° 2941.

HUGHES, EDWARD THOMAS.—(*A communication from C. Kessler.*)—This invention relates to the manufacture of welded tubes, which are composed of separate inner and outer sections of suitable curvature, the joints of the inner being overlapped by the outer sections, and vice versa. When placed in position to form a tube, the sections are kept in their respective places by a binding of wire wound round them externally, and in this state they are welded together by the pressure of grooved rollers externally, and supported internally during the process by a fixed mandril fitted with an enlarged conical head, which is projected into the groove directly between the rolls, the grip whereof forces the tube on to the mandril, which is supported by another pair of grooved rollers at the back of the machine. The mandril is provided with a number of conical head pieces, which may be changed at pleasure, and thereby much time is saved in the process.

Smaller tubes are made by drawing out and reducing tubes made on mandrils according to the first process. These small tubes are supported during the second rolling by a filling of granulated stone or other infusible material, the ends of the tube being closed by suitable stoppers during the rolling operation, are opened afterwards and the contents removed.

[Printed, 10d. Drawing.]

A.D. 1860, December 1.—N° 2946.

GREAVES, HUGH.—This invention relating to the construction of railways, tramways, and the wheels of vehicles adapted for running either on tramways or common roads, consists as regards rail and tramways, in the combination of a fixed rail with a tramplate, which are either cast together in one piece, or a wrought iron or steel rail is inserted in a groove made to receive it in the tramplate.

When metal sleepers are employed they are preferred to be in the form of pipes, through which aqueous fluids or gases may be conveyed, the rail or tram being longitudinally cast along the uppermost side of the pipe. The ends and sockets of these pipes are united by means of conical or cylindrical metal collars, heated and shrunk on over the ends, which are driven one into the other; and in order to provide for expansion, there is introduced at

intervals a partially yielding joint, comprising a collar of wood over the joint inclosed by a collar of iron, the two collars being tapered to correspond are driven one over the other, the heating and shrinking of the metal collar being in such case dispensed with.

A previous patent relating to fish-jointing sleepers, granted to this inventor March 5, 1857, No. 645, is referred to as applicable to tubular sleepers with strengthening ribs.

When the tubular sleepers are not employed for the conveyance of aqueous or gaseous fluids, they are made to serve the purpose of drains.

[Printed, 8d. Drawing.]

A.D. 1860, December 12.—No 3048.

NEWBY, HENRY.—(*Provisional protection only.*)—This invention, relating to the manufacture of the metal frames, slides, tubes, and parts of umbrellas, and parasols, consists:—

1st. In a method of jointing the stretchers to the ribs, which are both of solid wire. The stretchers are formed without the usual forked end, and are connected to the ribs by a jointing piece, which is bent up to embrace the back of the rib.

2nd. Stamping or pressing the notches of the runners out of sheet iron heated to a red heat.

3rd. Fixing the solid knob to the ferrule ends of the tubes used in the manufacture. Instead of passing a pin crosswise through the tube and stem of the knob, and as heretofore cross pin them together, the diameter of the stem just below the knob is made smaller than the end which fits to the internal size of the tube, and when slid in, the end of the latter is caused to close or contract round it by the pressure of suitable tools.

4th. The metal tubes employed in the manufacture of umbrellas and parasols are passed, for the purpose of straightening them, through a machine, similar to the machine "described for "straightening wire in the Specification of a Patent granted to "James Cocker, and dated the 10th day of December, 1855, No. "2781, and I cause the tubing to pass slowly through the machine and be strained over antifriction rollers (each capable of "adjustment) mounted in a rotating frame, by which injurious "friction is avoided."

[Printed, 4d. No Drawings.]

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A.D. 1861, January 9.—N° 53.

TAYLOR, WILLIAM.—This invention relates to the construction of a combined heating and ventilating duplex pipe, which may be made in any required length, form or size, of cast, malleable, or sheet iron, or other metal or substance, in two sections or compartments, one section being capable of containing heated water, steam, gas or other heating medium, and the other section forms an air passage or chamber which may be divided, and by means of branches separately placed in communication with apartments, and places where it is desired for the purpose of warming or ventilating, to introduce the heated air, there being to each division a separate inlet to admit fresh air, and an outlet for its distribution, whilst the heating medium in the other section of the pipe passes through in a continuous flow. These duplex pipes may be jointed together in the ordinary or other convenient manner by rigid or flexible joints, so as to be capable of being moved or shifted from place to place in mines, ships, and places, there being provided suitable bends and connexions for the purpose. The air passage may be either placed concentric or otherwise within the heating pipes, or it may be made exterior thereto.

Other pipes made of sheet metal are described containing three separate passages, the central one for air being interposed between two side passages, which constitute the outflow and return of the heating medium, so that only one line of such pipe is required to heat and ventilate a room; these pipes are adapted in place of the skirting board round an apartment.

[Printed, &c, Drawing.]

A.D. 1861, January 11.—N° 82.

NORMANDY, ALPHONSE RENÉ LE MIRE.—This invention relates to a method of uniting or jointing together the ends of gas and other pipes, which are made plain from end to end without flanges or sockets. The ends of the two pipes when placed end to end together are held in position by a tubular collar, which is slid loosely over the two ends and covers the joint. The extreme ends of this collar are enlarged so as to form an internal recess at each end respectively to receive a packing ring of india-rubber or other suitable material, and against these rings, one disposed on



each pipe, are two flanged rings which are suitably formed and when drawn together by means of nut bolts, they force the packing rings into the recesses of the tubular collar, causing the packings respectively to spread and close round the pipes, filling up the space round the pipe ends, and forming a perfectly tight joint.

According to a modification, the packing rings, instead of being inserted in recesses formed in the ends of the coupling collar, are disposed in recesses formed in the two flanged rings, and in this case the ends of the coupling collar are plain.

[Printed, 8d. Drawing.]

A.D. 1861, January 24.—No 194.

GIBSON, THOMAS, KNIGHTON, WILLIAM, and KNIGHTON, HENRY.—This invention relates to the construction of collapsible core barrels, for use in casting pipes, cylinders, retorts, and other tubular or hollow articles. These core barrels are formed externally by two segmental main sections longitudinally jointed together along one edge, and a filling piece or longitudinal key, the segmental face of which is interposed between the other or free edges of the segmental sections, when the latter are expanded by means of a cramp, and by filling up the intermediate space completes the cylindrical form of the shell or barrel. Inside the barrel there are strong springs, fitted there for the purpose of drawing the free edges of the main sections together over the segmental face of the key, which is free to retire when chipping pieces on the tail of the key and bracket pieces on the inside of the main sections are disengaged after a casting has been made, and the contraction of the core bar is required to take place before it can be withdrawn.

[Printed, 8d. Drawing.]

A.D. 1861, February 2.—No 277.

SPENCER, GEORGE HOLME and COOK, RICHARD GEORGE.—(*Provisional protection only.*)—The first part of this invention relates to the formation of the hole in the extreme ends of umbrella and parasol ribs, by means of a "hub" and a die or bed, with a view to impart a neater appearance and additional strength. Heretofore the end of the rib, where the hole is required, has been first flattened and the hole pierced through, but by the aid of the

hubb and die, the rib is indented at opposite sides, and the hole is pierced through the thin metal.

Heating steel wire and tubes, also ribs and stretchers of umbrellas and parasols preparatory to hardening them. These articles and details are placed in cylinders or tubes of iron or other metal or suitable substance. The cylinders or tubes are internally divided into separate compartments or chambers to contain the different articles, and whilst in the furnace the cylinders are turned and shifted about, in order that all parts of their surface may be uniformly exposed to the heat, which reaches the interior and is more evenly diffused amongst the articles. By this means a larger quantity may be heated with better effect in a given time, and a saving of fuel will be the result. Tubes, rods, ribs, and articles for the like and other purposes, may be heated in the same manner.

[Printed, 6d. Drawing.]

A.D. 1861, April 4.—N° 826.

GRICE, JAMES THOMAS.—This invention relates to a method of ornamenting metallic tubes by means of a series of rollers, which have the design engraved or formed on them externally. The axes of these rollers are all disposed on the same plane at intervals around a common centre, approaching which their peripheries form an opening wherethrough the tube is passed, the several rollers during its passage pressing upon it from opposite directions and collectively embracing it and producing the design upon its surface, each roller operating upon a segmental portion longitudinally as the tube is passed through. The main feature of the invention consists previous to the operation, in filling the tube with a solid or plastic substance, that will yield to the pressure of the parts which form the design on the rollers, and at the same time support those intermediate parts of the tube which the details of the design avoid. The materials which have been found suitable for filling the tube are pitch, lead or other soft metal or alloy, gutta-percha, sand, or wood. Of all these pitch melted and poured into the tube is found to answer fully better than the rest. Tubes fluted longitudinally or twisted, and parallel or tapering tubes may be ornamented by this process.

[Printed, 4d. No Drawings.]

A.D. 1861, April 5.—N° 847.

HUTSON, JOHN.—This invention relates to the employment of tubes in the construction of parts of bedsteads and other articles of furniture, and to the method devised for forming joints or connections. To this end the pillars and posts of bedsteads are formed "of tubes made from thin sheet iron, first cut to the required size and then lapped over at the edges, which are hammered together on a mandrel, so as to form a perfect seam throughout the length of the tube. Each length of tube has a flange brazed on to one of its ends; by which it is fixed to the connecting boss. . . . The said connecting boss consists of a short wrought-iron cylinder, the interior of which is intersected by a plate (less in depth than the said cylinder) placed vertically across it and brazed in that position. On the top and also on the bottom of the said plate, is brazed a flat ring, which forms an internal flange within the ends of the said cylinder. The flanged ends of the tubes forming the legs and standards of the posts or pillars are fitted within the ends of the said connecting boss, and are fixed therein by rivetting over the ends of the said boss on to the edge of the flanges. Apertures are cut in the side of the connecting boss to admit the ends of the side and end rails of the bedstead. The said rails are cut taper at their ends, and are inserted into the said boss through these apertures and abut against the plate intersecting it. The posts can be ornamented and mounted in the ordinary manner."

[Printed, 10d. Drawing.]

A.D. 1861, April 19.—N° 965.

MACLAREN, ROBERT.—(*Provisional protection only.*)—This invention has for its object a simple and efficient mode of jointing or connecting together the ends of socket pipes, or as described by the inventor, pipes formed with the ordinary spigot and faucet, and turned respectively externally and internally according to the usual method.

"In addition, however, there is formed a groove upon the turned part of the spigot running round it, and when the pipe lengths are to be connected, rubber, hemp, or other compressible packing is placed in this groove in such a way as, when free, to project slightly above the turned surface. Then, when the spigot

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" is driven home into 'its faucet, the rubber or other packing " becomes compressed and renders the joint perfectly tight. The " groove may be at the extreme end of the spigot, and there may " be two or more grooves similarly packed at each joint."

[Printed, 4d. Drawings.]

A.D. 1861, April 22.—N° 993.

BOURNE, EDWARD DOUGLAS and DAVIS, PAUL.—This invention relates to the manufacture of grooved cornice poles and curtain rods and laths, and to the metallic slit tubing used for the purpose. This tubing has a slit throughout its whole length, which opens into a small inner tube that forms a groove for the runners by which the curtain is suspended, the edges of the inner tube being soldered or brazed to the edges of the outer tube or rod. In some cases both the inner and outer tubes are made out of one piece bent to form upon a grooved mandril, and passed successively through suitably shaped dies by means of a draw-bench; and instead of making the outer a perfect tube, the small slit tube may be formed out of a narrow sheet or ribbon of metal, the edges being bent back to form the edges of the groove and segmental portions only of the larger tube.

Metallic fluted rods and poles are also produced by means of dies and a draw-bench, the edges of the seam being left open to receive the small slit tube, which is soldered in between them.

For curtain laths the small slit tube is used alone, and attached to the wood lath by means of screws.

[Printed, 8d. Drawing.]

A.D. 1861, April 25.—N° 1029.

SCOTT, GEORGE.—This invention relates first, to the construction of steam engines of the oscillating class; second, to cooling and condensing exhaust steam; third, saturating highly superheated steam, with vapour of water mixed with oil or tallow for lubricating purposes; and fourth, the means of connecting the pipes or tubes of steam generators, surface condensers, the pipes in hot houses, and other places where it may be required to remove them expeditiously for repairs or otherwise. Two modes of jointing pipes and semicircular bends are described. According to the first mode, the ends of the pipes are V- formed, and the *ends of the bends* are correspondingly recessed, and being placed



in position relatively, they are drawn fluid-tight together by nut bolts, which pass through the pipes and straight out through the curved back of the bends respectively, the bolt head being outside one bend, and the threaded end, passing out through the other receives the nut outside.

According to the second mode of connecting pipes and bends, their ends are prepared in the same manner, being V- formed respectively to fit one into the other, and are either drawn together by short bolts which pass through a hole drilled completely through the center of the curve of the bend, such bolt head being held by a plate the ends whereof catch against projections on the pipe ends, or their ends are respectively brought into fluid-tight contact by a kind of yoke or strap furnished with claws, which engage with projections on the pipes; the yoke fits over the bend, and by means of a screw which passes through its curved end, and presses upon the curved back of the bend, the ends of the pipes are drawn up to the ends of the latter, and fluid-tight joints are effected.

[Printed, 1s. 4d. Drawings.]

A.D. 1861, May 21.—N<sup>o</sup> 1291.

MENNONS, MARC ANTOINE FRANÇOIS.—(*A communication from J. B. Larril.*)—The object of this invention, relating to a method of connecting or jointing pipes end to end, is to be able in laying them to follow the sinuosities of the locality without having recourse to elbows or bends; to make the joint internally almost imperceptible; to compensate expansion and contraction; and to correct rigidity and consequent liability to rupture at the joint.

Around the end of one pipe there is formed a projecting bead or collar grooved on its periphery to receive the inner edge of an india-rubber washer, at the back of which loosely upon the body of the pipe, is placed a movable ring, furnished at its opposite sides with bolt lugs. The end of the other pipe to which it is to be connected has the form of a shallow socket, with corresponding projecting lugs, and contains a recess to receive the extreme end of the other pipe, and a surface or seating against which the washer is forced when, by means of the lugs and nut bolts, the movable ring is tightened up against the india-rubber washer, forcing the latter against the seating in the socket, and causing its lateral dilation, so that its periphery is extended and forced outwards against the socket walls. By this means what is termed

" an elastic, compensating, and hermetical pipe-joint " is effected, the arrangements being capable of modification.

[Printed, 10d. Drawing.]

A.D. 1861, June 7.—N° 1442.

HARLOW, ROBERT.—This invention relates to the construction of multitubular bridges adapted to steam boilers generally, and to the construction of heating tubes or cylinders, which are disposed in alternate diagonal positions across the flues of the steam boilers which are constructed therewith internally.

The bridge is made of boiler plate, and excepting a narrow opening at the top between it and the bottom of the boiler, it occupies the entrance to the flues; it is in communication with the boiler, and is filled with a number of tubes, which are set into the plates that respectively form its front and back, so that the fiery draught streaming from the furnace, passes direct through the bridge into the flues, excepting that portion which takes through the narrow opening at the top; by this means a constant circulation of the water is caused to pass through the bridge, which assists the boiler in generating steam.

The heating tubes or cylinders are made 6 inches in diameter and by preference of steel with hemispherical ends; in length they are somewhat shorter than the diameter of the boiler flue. They are fixed alternately in opposite diagonal positions at regular intervals across the flue, there being about twelve of such cylindric tubes in each flue of a full sized boiler, the ends of each respectively communicating with the water in the boiler by means of small tubular connections at each end, and when necessary for cleaning, repairs or otherwise, are capable of removal.

[Printed, 10d. Drawings.]

A.D. 1861, August 3.—N 1924.

BISH, GEORGE and DREDGE, JAMES.—(*Provisional protection only.*)—This invention relates to a mode and apparatus for forming or bending pipes made of fibrous and other materials and substances; it is also applicable to the bending or curving of metallic pipes. This method of bending is effected by the use of a series of rings, which are severally broader at one side than at the other; these rings are placed close together upon the pipe, so that their broadest sides are in contact. The pipes are then

softened by heat, and by means of screws or other contrivance, are bent so as to cause all the narrow sides of the rings to close together, and assume the required form. These rings may be also employed internally during the operation, and in order to prevent the collapse of a tube whilst undergoing the bending process with the rings placed externally, coiled wire may be used as a support for the inside, and afterwards withdrawn.

The invention also relates to the making of bends or bent pipes of successive laminae of non-metallic substances, such as paper, linen, &c., upon collapsible mandrils, and to various methods of treating, applying, and working such substances into the form required.

[Printed, 4d. No Drawings.]

A.D. 1861, August 14.—N° 2020.

DURAND, FRANÇOIS.—(*Provisional protection only*).—This invention relates to the manufacture of metallic tubes without seams, by casting them severally in a mould containing a core specially arranged to permit of the free escape of the air when the molten metal is run in. For this purpose round the core is disposed longitudinally a number of metal rods or staves side by side in close contact, or when a lesser number of rods is used, they are covered with wire closely coiled round the core from end to end. When the tube is cast, it is placed in a strong metal mould and compressed by drawing in succession through it a number of rods, each having a conical head piece or knob progressively in relation to the others increasing in size, the smallest being used first. After this part of the process the tube is operated upon externally by drawing it through suitable dies or plates at a draw-bench, fixed mandrils or rods with conical heads being employed to support the interior. A number of tubes progressively graduating in size and placed one within another may, when so arranged and the innermost tube filled with any suitable malleable metal, be all operated upon at the draw-bench simultaneously.

[Printed, 4d. No Drawings.]

A.D. 1861, September 5.—N° 2213.

BENNETT, FREDERICK.—This invention relates to an hydraulic press or apparatus adapted for making lead or other soft metal





“ the end of which a mandril is fixed of the required size, but  
 “ smaller than the hollow bar; through this bar or pipe the  
 “ wires intended to be incorporated are passed, which are drawn  
 “ through apertures or holes at the end of the bar, and passed  
 “ outside or surrounding the mandril. Betwen and around such  
 “ wires the metal or plastic material is forced before entering the  
 “ die. Twist may be communicated to the wires by causing the  
 “ hollow bar through which the wires are passed to revolve,  
 “ carrying the wires around with it.”

[Printed, 10d. Drawing.]

A.D. 1861, September 28.—N° 2430.

COMER, CHARLES, junior. — (*Provisional protection only.*)—

This invention relates to the manufacture of metallic tubes and the application thereto of a process of combining metals and alloys of metals described in the specification of a patent granted to this inventor and Daniel Stone, and bearing date April 5, 1861, No. 836. The tubes are to be used in the construction of bedsteads and for other purposes, and they are made by bending sheets of metal over a conical roller which is furnished with a groove. “ One edge of the metal sheet is placed in this groove, and when the roller is turned round the remainder of the sheet  
 “ of metal is bent into a tapered tube; the edges are then brazed  
 “ or otherwise secured together. The end of the conical roller is  
 “ raised to allow the tube to be taken off.”

“ In making ornamental tubes, either tapered or otherwise, with flutes or spiral ribs or other designs on their surface, the sheet of metal is passed between two rollers, the surfaces of which are made with projections and depressions corresponding to the design to be produced.”

[Printed, 4d. No Drawings.]

A.D. 1861, October 1.—N° 2444.

LESOURD, OSCAR OCTAVE.—(*A communication from Jules Lemoine.*)—

This invention relates to a method or coupling for jointing or connecting together the ends of pipes, formed with either sockets or flanges, which are held together in the usual way by bolts. The ends of the pipes thus connected are enveloped by a kind of coupling box, elliptical in shape, and formed with a neck at each end to fit on to the contiguous ends respectively of

the two pipes. This box of wood or cast iron is made in two longitudinal parts or halves, which are jointed together, and when closed and fastened by a pin, a cavity is formed round the meeting ends of the two pipes, which cavity through a cup-formed orifice is filled with a kind of cement or substance called the "sealing" agent, which in cooling sets round about the joint, and renders it tight and sound. In many cases the sealing agent consists of sulphur in a state of fusion, used either alone or mixed at a high temperature with peroxide of iron, red or yellow ochre, or other similar ingredient; soft metallic and other substances may also be used for the purpose.

[Printed, *sd.* Drawing.]

A.D. 1861, October 10.—N<sup>o</sup> 2533.

CHRISTOPH, LOUIS, HAWKSWORTH, WILLIAM, and HARDING, GUSTAVUS PALMER.—This invention relates to the manufacture of cylindrical, conical, or other form of tubes, from pure and highly ductile steel, first cast in tubular ingots, or formed in cylindrical blocks and made tubular by boring. The process comprises drawing and rolling, or both processes combined. For drawing and rolling tubes of uniform diameter a mandril with two or more swellings or enlargements graduating in size is employed, the smallest enlargement coming into action first. The draw-plate employed with these mandrils is made "considerably thicker than the ordinary draw-plate or wordle, " and has a conical draw-hole or aperture therein to correspond " to the graduated sizes of the enlargements on the mandrill. " In the making of conical or tapered tubes, such, for example, " as are required for gun barrels, we employ a conical mould or " matrix, into which a tube is introduced after it has been rolled " to a tapered form, and through this tube a mandrill similar to " the one above described is drawn, so as to expand and elongate " the tube until it entirely fills the conical mould or matrix, the " result being a conical tube with a cylindrical bore. This tube " may have rifle grooves indented or drawn therein, in lieu of " cutting such grooves, by using a mandrill having suitable projections thereon, and to which a proper rotatory motion is imparted during the time it is being drawn through the tube " or barrel." When large pieces of steel are operated upon, a succession of mandrils and apertures gradually decreasing in diameter are employed.

Drawn conical steel tubes are first subjected to the drawing process, and then passed through a pair of rolls having tapered grooves or channels, a mandril being employed internally to prevent crushing or flattening. Tapering tubes of any required transverse sectional form externally and cylindrical in the bore, may be produced by this process, a mandril being subsequently drawn through them. Gun barrels may be rifled by compression, the grooves in the barrel, which is caused to rotate during the process, being formed by projections on the mandril, the tube or barrel during the smoothing and drawing through operation being (to prevent its enlargement) firmly secured in a matrix or mould.

[Printed, 10d. Drawing.]

A.D. 1861, October 19.—N<sup>o</sup> 2614.

BOURNE, JAMES, and KIDD, EDWARD.—This invention relates to machinery adapted to perform "the breaking down or "reducing" part of the process in the manufacture of seamless tubes and cylinders from tubular ingots or masses of metal or metallic alloys, by means of two rollers, each of which has a hollow or concave surface, and instead of being mounted in parallel position their axes (one above the other) are disposed relatively at right angles, so that the top roller is transverse to the roller beneath; they are caused to revolve by suitable gearing, and the tube on which they operate is placed upon a mandril and passed between them in a diagonal direction. The combined action of the rotating rollers imparts a spiral direction to the grain of the metal of the tube, by reason of its being compressed between two bodies revolving in opposite directions, and diagonal to its line of progress. The distance apart of the two rollers is regulated by suitable setting down screws, and the reducing and lengthening effect is produced on the tube by a quick succession of passes between them before the metal has time to cool. Tubes and cylinders so rolled do not fasten upon the mandril, and they do not require reheating during this part of the process, which is finished at the draw-bench in the usual manner, or in the case of large cylinders, by rollers with plain surfaces, the axes of the cylinders and rollers being disposed for this finishing part of the process relatively parallel.

[Printed, 1s. Drawings.]



A.D. 1861, October 26.—N° 2691.

**TAYLOR, WILLIAM.**—This invention relates to a mode of joining or connecting together the ends of flanged pipes by means of dovetail cottars and keys, in lieu of the ordinary bolts and nuts. Instead of the slotted openings which are usually formed in the flange at each end of a pipe for the connecting bolts, the openings have a dovetail form, their narrowest part extending to the periphery of the flange, which is cut away and when the meeting faces of the flanges of two pipes are with an intermediate packing placed in position to be connected, the dovetail cottars are passed through the dovetail openings in the flanges in the direction of the length of the pipes and drawn tight up by keys driven through slotted holes in their ends. Pipes requiring to be laid in a position deviating from a direct line, have also annular packings placed between their meeting flanges, but the surfaces of such packings are relatively more or less inclined according to the new direction required to be given to the line of pipes.

[Printed, 6d. Drawing.]

A.D. 1861, November 5.—N° 2773.

**LIVESEY, JAMES.**—(*Provisional protection only.*)—This invention, relating to a pneumatic apparatus designed for signalling or communicating in railway trains, and to a mode of coupling pipes, consists, as regards signally, in sounding whistles whereby communications may be made between the guards, driver, and persons in a train. A system of pipes extends throughout the train, and in each guard's van, and in any other convenient carriage, is fitted a bellows and whistle, connected by lateral branches to the main pipe, which also communicates with the lever handle of the engine whistle by means of the piston rod of a small cylinder, fitted at the end of the pipe. The above arrangements may be modified.

“ The pipes are coupled in any convenient manner, or by a socket lined with india-rubber or other suitable yielding material, into which a bush with a slightly enlarged end fits. This improved coupling may be used for connecting gas and other pipes; the advantage it possesses over other couplings is that it can instantly be connected and disconnected.”

[Printed, 4d. No Drawings.]



A.D. 1861, November 9.—N° 2811.

COWAN, DAVID.—This invention relates to the construction of "pneumatic subaqueous tubes for passenger or goods traffic," and to the apparatus employed for making them. These tubes are constructed with staves of iron, wood, or other material solid or hollow. They are held together by a continuous iron band, wrapped spirally round by the apparatus as the tube is formed. The staves are arranged longitudinally side by side round a mandril, each one breaking joint with those beside it after the manner of placing bricks when constructing an arch. "Encircling the staves thus arranged is a ring carrying a series of rollers within its interior circumference for the purpose of pressing the staves firmly together. Immediately behind this ring is another which revolves round the tube, and laps spirally round it one or more bands of iron, and it is driven by means of one or more endless screws and screw wheels; this ring is permitted to move only in the direction of its circumference, that is to rotate, all lateral motion being prevented by suitable bearings or abutments, and a projection fixed to the said ring is in contact with the edge of the iron as it is wound on the tube; this projection not only keeps the coils well together but thrusts the tube forward," at the rate it is completed, the band acting as the thread of a screw. By this means the tube may be projected into the water as it is made, and if the staves are made hollow, it may be caused to float more or less by the admission or withdrawal therefrom of water.

[Printed, 10d. Drawing.]

A.D. 1861, November 11.—N° 2827.

STEWART, DAVID YOOLOW.—This invention relates to the construction of the patterns and cores employed in the casting of metal pipes and articles of similar form, to drying the moulds and cores, and to a method of clearing the cores from the pipes after the casting is made.

The patterns for pipes, etc. are made contractable, so that when moulded in a vertical position they are easily drawn out of the sand; they are made tubular of metal with a longitudinal slit, the edges of which are bevelled in both directions to receive a dovetail wedge or tapering strip, which when forced in expands the pattern to the diameter required for the casting, and when

withdrawn after the moulding process permits it to contract; the core boxes are made upon the same principle for expansion and contraction, and after the casting is made, the sand of the core is removed from around the core bar by a pendant band-saw, which has vertical action, and being carried round the common center of the core gradually cuts away the sand.

The ramming of the sand into the cylindrical mould and core boxes whilst in a vertical position is effected by a piston working in an inverted steam cylinder vertically disposed above the mould box, the rammer consisting of a circumposed series of rods depending from a ratchet wheel, which is mounted to revolve intermittently on the end of the piston rod; the steam cylinder being counterbalanced by weights, rises gradually as the sand is rammed into the mould; the cores are also made in the same manner, the mould boxes and the other apparatus being carried vertically on separate trucks, which run on two lines of railway, a high and low level, so that the metal pattern can be brought into position beneath the mould box to be raised therein, and after the mould is made lowered by the same means; the cores are carried on trucks, and introduced and adjusted in the same manner.

[Printed, 10d. Drawing.]

A.D. 1861, November 12. —N° 2843.

JOHNSON, JOHN HENRY. —(*A communication from Joseph Harrison.*)—This invention relates to a peculiar kind of wire packing ring of copper or other metal that will yield to compression, and is adapted for use in jointing or connecting together the ends of steam, gas, and water pipes, and for other similar purposes. This ring at one point in its circumference is separated by a cross cut. It is disposed in an annular groove cut in the meeting surface of the end of one pipe, the meeting end surface of the other pipe being quite plain. The ring when placed in the groove should be somewhat too large, but when the pipes are drawn together it is forced fairly into the groove and the parts separated by the cut are jammed together. By this means the surface of the ring is compressed between three trigonal points, viz., the two sides of the groove in the end of one pipe and the plain meeting surface of the other, and thereby, as stated by the inventor, a tight joint is effected.

"In all cases the ring should be slightly larger in diameter than is required for the actual joint before it is compressed by the tightening up of the two halves of such joint, so that the compression of the two parts of the joint will at the same time effect the tight closing of the split in the ring and so complete the efficiency of the entire joint. Any section of ring may be used with any form of groove or angular surface, provided such ring and surfaces be so constructed as to effect the closing of the ring by the compressing together of the two junction surfaces."

[Printed, 8d. Drawing.]

A.D. 1861, November 14.—N<sup>o</sup> 2868.

HEAP, WILLIAM.—(*Provisional protection only.*)—This is the invention of an instrument adapted to the transverse cutting of metallic pipes and bars. It "consists of a frame with an opening in it, through which the pipe or bar to be cut passes; the pipe or bar is held in the frame between rollers, and at one side of the frame is a screwed boss for the bush of the handle which is made with a spindle acting on a sliding stud, to which one pair of the rollers is connected; and at the other side of the frame is the cutting tool, which is acted upon by the spindle of the other handle, the bush of which is also screwed on a boss. The instrument is turned round by the handles above referred to, in order to cause the cutter to act on the pipe or bar."

"The above is a convenient mode of constructing the improved instrument, but the details may be varied."

[Printed, 4d. No Drawings.]

A.D. 1861, November 23.—N<sup>o</sup> 2944.

WEEMS, JOHN.—This invention relating to the manufacture of tubes and articles of zinc, and to coating or plating such and other metallic surfaces, consists in:—

1st. Making tubes of zinc either by rolling or drawing out a primary block or cylinder, or from sheet zinc cut to the required form, and made cylindrical by any convenient means, such as with dies or rollers, lap jointed and soldered and drawn through dies, the metal being annealed and rendered ductile previous to working it, and during the process the metal, as also the dies, rollers and apparatus, are to be kept in a heated state.



The tubes thus formed are to be "coated or plated with metal, which is done by immersing them in suitable chemical solutions, and precipitating the metal or metals with the aid of a galvanic battery. Zinc tubes formed in this manner perfectly smooth and cylindrical, and subsequently plated with copper, tin, brass, or other metal, are applicable to numerous purposes in the arts for which copper and brass have heretofore alone been used, and to which zinc has not hitherto been applied. These tubes may also be plated with silver or gold, or be otherwise decorated with transparent colours, either by the stencilling or printing processes, so as to be available for various decorative purposes, as for example, balustrades, parts of metal beadsteads, picture rods, and many other purposes where metal tubing forms the principal or secondary portion of the constructive details."

2nd. Coating or plating zinc mouldings and other articles of "struck work," the object being to render their use more general, to protect the zinc from atmospheric influence and admit greater scope for artistic decoration.

3rd. Relates to the manufacture of articles of zinc or zinc alloy, and to subsequently rendering such articles "acid-proof, by coating them with any of the metals or metallic alloys which are capable of being precipitated by galvanic agency or other equivalent means. In this way many of the articles which are now manufactured of expensive metals, may be replaced by vessels comparatively inexpensive, and at the same time as efficient in practical use."

[Printed, 4d. No. Drawings.]

A.D 1861, December 2.—N<sup>o</sup> 3024.

RALSTON, GERARD.—(*A communication from Jacob Snider, junior.*)—This invention relates to the manufacture and application of an anti-corrosive composition, suitable for coating or covering ships, iron plates, and articles liable to oxidation. This composition consists of amorphous graphite in a finely powdered state mixed with oil and beeswax in the following manner:—

The powdered graphite is put into a vessel or mixer capable of being made warm by a coiled steam pipe or otherwise. The oil (raw linseed) is first added in the proportion of 1 lb. of oil to 3 lbs. of powder, and when they are thoroughly mixed together, the beeswax in a hot melted state is added, the proportion of the latter



being 1 lb. of wax to every 10 lbs. of the powder. The bees-wax is to be thoroughly mixed with the oil and powder, and when the compound is cold, it is to be ground to a suitable consistence in a paint mill, additional oil being added if necessary. The composition is applied to iron plates and hulls of vessels which are to be previously heated, and when applied to wooden ships the composition is used as hot as possible, the wood being entirely free from moisture.

For the purpose of preserving iron pipes against oxidation and "tubercles" the inventor says:—

"I propose to take the pipes hot from the casting, as soon as they can be freed from the sand, and, before they cool sufficiently to allow any atmospheric moisture to set upon them, to plunge them into a bath of the "graphitic composition." When cold and the coat of the graphitic composition has "set" dry, they should receive a stout coating of the graphite paint."

[Printed, 4d. No Drawings.]

A.D. 1861, December 6.—N<sup>o</sup> 3066.

RUSSELL, JOHN JAMES and BROWN, BURDETT LAMBTON.  
—This invention relating to the manufacture of taper tubes, refers more particularly to the dies employed in combination with a draw-bench. These dies have the form of grooved rollers or segmental portions of grooved rollers, with axes mounted to revolve in bearings, one roller or segmental die being horizontally placed above the other on the same vertical plane, so that the groove of one roller or die coincides exactly with the groove of the other. To the rollers or dies a slow rotating motion is imparted, and this is limited to a portion of a revolution and made uniform by tooth wheels, which gear together and are fixed, one on the axes of each die. The grooves in the dies gradually decrease in breadth and depth from one to the other end of their action, so that the size of the die-hole formed by the meeting of their respective grooves whilst they slowly rotate, gradually diminishes from one extremity to the other. The speed at which the tube is drawn through the dies, is much greater than the speed at which they revolve, and must be adjusted in relation thereto, according to the length and amount of taper required in the tube.

When it is desired that one portion of a tube shall be uniform in diameter throughout its length and the other portion tapering,

the slow rotating movement of the dies is suspended whilst that portion of the tube required to be uniform is drawn through.

The arrangements of the draw-bench or machinery, and the manner of rotating the dies may be varied.

[Printed, 10d. Drawing.]

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## 1862.

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A.D. 1862, January 8.—N° 52.

JESSON, SAMUEL, BÂTSON, JAMES the younger, MOORE, JOHN the younger, and ROBERTS, JAMES.—(*Provisional protection only*).—This invention, relating to the manufacture of gun barrels and wrought-iron tubes, is stated by the inventors as follows:—"We take a bloom of wrought-iron, and heating in a heating furnace, we pass it through a pair of grooved rolls, by which it is elongated, and its diameter reduced. The billet thus produced is passed, while still hot, through a second pair of grooved rolls, the grooves in the last-named rolls having such a figure that they give to the billet the shape of a semi-hollow cylinder or half tube, the interior being nearly semi-cylindrical, and the exterior having three or more planes or sides. The edges of the half tube are not plain, but have each a bead or rib running along its whole length. We take a second billet, and by grooved rolls we roll it into a shape similar to that last described, excepting that in place of ribs or beads running along the edges, we make grooves or depressions in the edges of a figure corresponding to that of the beads or ribs on the first made half tube. We take the two half tubes and place them together so that the beads or ribs on the edges of one engaged in the grooves or depressions in the edges of the other. The two half tubes thus fitted together are heated in a mill furnace, the partially formed tube resting on one of the planes on its outside. It is heated to a welding heat, and when properly heated is removed from the furnace and passed through a pair of grooved rolls, by the pressure of which the two half tubes are welded together. The half tubes or moulds may either be welded together in the same works, or supplied to gun barrel and tube makers to be welded together by them. Instead of

“making both ribs or beads on the edges of one half tube or mould, and both depressions in the other, each half tube or mould may have a rib or bead on one of its edges, and a depression in the other.”

[Printed, 4d. No Drawings.]

A.D. 1862, January 14.—N° 102.

HUGHES, EBENEZER WILLIAM.—The object of this invention is to improve the construction in wrought or malleable iron of tubes and cylinders for engineering, and architectural structures. These tubes and cylinders are made with one or by combining two or more plates of the metal bent crosswise to form segmental divisions, except the two marginal side edges of each plate, which are turned outwards in a direct line from the center, whether the tube be circular or elliptical, but if required to be polygonal, square, or other transverse configuration otherwise than curved, then the bending of the plates is not required. The marginal edges thus turned out form longitudinal flanges to receive the rivets which fasten the plates together, and in the finished tube the flanges rivetted together project radially in longitudinal lines.

“In order to join the ends of the several parts of a cylindrical or other column or tubular support, and also in order to produce projections therefrom with a view to the columns or supports being connected to other parts of an engineering or architectural structure, a short tube or cylinder with an outer flange is introduced into the end of a section or portion of a column, and is fixed therein by rivets.”

[Printed, 8d. Drawing.]

A.D. 1862, January 14.—N° 104.

JACK, JAMES.—(*Provisional protection only.*)—The object of this invention relating to the preparation of cores for moulding and shaping metals “is to supersede entirely or partially the use of hay, straw, and other like fibrous bands and materials in the running or making of cores for moulding and shaping metals, especially such as are prepared for the casting of pipes, cylinders, retorts, and other like hollow ware, by substituting cheap and effective material capable of being used a number of times, and of a nature that will assist in drying the said cores. For this purpose metallic or other chains are used or applied, either

“ taking the place of the hay, straw, or other fibrous bands entirely, or being used in connection with a small quantity of the said fibrous materials. Perforated, unperforated, or solid core bars or centre pieces may be used, and with any of these the chains may be applied spirally, longitudinally, or otherwise, as the air is equally drawn off, and the strength and thickness uniform throughout, whilst in some cases the core bars and centre pieces might be dispensed with. The loam is run on or pressed over the chains, and the whole dried and finished in the ordinary manner.”

[Printed, 4d. No Drawings.]

A.D. 1862, January 24.—N° 183.

**CORNFORTH, JOHN, and SMITH, BENJAMIN.**—This invention relates to machinery or apparatus designed for boring or drilling gun barrels, tubes, and articles having transversely either a cylindrical, polygonal, or other configuration. For these purposes three machines are described, consisting of:—

1st. A machine constructed to act on the principle of a boring lathe, having two headstocks disposed side by side on a single horizontal bed, whereon are also mounted, a double rest for supporting the boring tools and the outer ends of the bars which when bored form tubes or barrels, and a double sliding rest which carries the boring tools, and is moved along the bed in the direction of the parallel axes of the lathe or machine by a revolving screw, the inner ends of the bars fitting into socketted nozzles formed on the ends of the axes or spindles, and turning therewith. This machine operates on two bars simultaneously.

2nd. This is also a duplex machine with two headstocks mounted on the highest end of an inclining bed. In this machine the boring tools are fixed projecting from the spindles or axes and revolve therewith, and the bars which are bored, are fixed in a kind of sliding box or carriage which is advanced along the bed against the boring tools in a direct line parallel with the two axes, by a rack and pinion. The sliding carriage is made in the form of a box to contain soap or other water wherein the bars are submerged during the operation.

3rd. This is a kind of duplex vertical drilling machine, also constructed to bore two bars at the same time. The boring tools are rigidly fixed projecting upwards in cylindrical cases, and the



bars are respectively disposed in two revolving cylinders, vertically mounted in a carriage, which is caused to slide downwards in the direct vertical lines of the two boring tools, by a rack and pinion. The cases which contain the boring tools are to be filled with soap-water, into which, as the operation progresses, the revolving cylinders which contain the bars descend, so that the tools operate beneath the surface of the water, and the borings gravitate to the bottom.

[Printed, 1s. 6d. Drawings.]

A.D. 1862, February 13.—N° 391.

McCONNELL, JAMES EDWARD.—(*Provisional protection only.*)—This invention relates to the construction of fire-bars for furnaces, and tubes for locomotive and other steam boilers:—

1st. The fire bars instead of being made level or straight on the upper surface have a convex form, and instead of being disposed lengthwise of the furnace, they are ranged side by side across it.

2nd. "Relates to a peculiar manufacture of the tubes employed in steam generators of all kinds, whereby they are rendered more durable, and are better protected against the action of the fire. For this purpose I propose to line the tubes with zinc, spelter, or other hard metal applied either in the form of an inner tube, or otherwise coated over the interior of the tube's surface during the process of their manufacture, or afterwards."

[Printed, 4d. No Drawings.]

A.D. 1862, February 25.—N° 513.

GUYET, PIERRE JOSEPH.—(*Provisional protection only.*)—This invention relates to an articulated coupling designed for connecting the pipes between locomotives and tenders, and applicable to other analogous purposes, the chief feature consisting in the use of two thick elastic india-rubber stuffing collars, which are deposited in recesses formed in the ends of a short union or coupling pipe, and through which pass into the chamber of the coupling pipe, the ends of the two pipes respectively of the locomotive and tender, between which the connection is to be made. The two elastic stuffing collars fill the recesses in the ends of the coupling pipe, and when pressed upon endwise by flanged annular

caps or glands, they are caused to spread laterally, and fit closely round the ends of the pipes, retaining, by reason of the thickness of the material, their elastic flexibility, so that, although the relative position or direction of the two pipes may constantly change, as also the distance between them vary, the ends of the pipes sliding freely through the stuffing collars, a fluid-tight joint under all changes of position is maintained. The coupling when disjoined is held on the end of one of the pipes by an annular nut, that pipe end being screw-threaded externally, and the end of the other pipe is easily withdrawn after the coupling bolts which secure the caps are unscrewed, the end pressure on the stuffing being thereby removed.

[Printed, 8d. Drawing.]

A.D. 1862, March 12.—N° 664.

DE NORMANDY, ALPHONSE RENE LE MIRE.—This invention has for its object an improvement in the method of connecting gas and other pipes which are made with plain ends without either sockets, flanges, or projections. In order to connect two pipes, two loose collars are slid, on one the end of each pipe, then two annular packing rings are slid on, one against the end of each collar, and next upon one of the pipes is slid a flat tubular ring. When the two pipes are placed end to end, the ring is slid back over the joint, one half length portion thereof being on one pipe and the other half portion on the other pipe, so that the tubular ring completely covers at its midlength the joint or junction of the two pipes. By means of nut-bolts the two collars are then drawn towards each other and the annular packings thereby compressed between them and the ends of the intermediate tubular ring, and forced to expand laterally into close contact respectively with the surface of the two pipes, thereby forming a tight joint. The annular packings may be of vulcanized india rubber, and smaller in diameter than the ends of the pipes, in order that they may have a tendency to close tightly round them, otherwise gasket saturated with tallow or red lead in a plastic state, may be employed.

[Printed, 6d. Drawing.]

A.D. 1862, March 29.—N° 874.

CLARKE, WILLIAM.—(*Provisional protection not allowed.*)—This invention has for its object the arrangement and combination

of parts forming, without the aid of straw or hay band lappings, the core bars employed in castings, pipes, and hollow cylinders, thereby saving time, labour, and material. These core bars (as described by the inventor) are severally "composed of three or more plates so formed as when put together to form a circular or other shaped core bar. Each of such plates is formed either with or without a central strengthening rib, and also with a V piece at each end adapted to fit into a correspondingly formed V ring, or V arms, for supporting and holding the plates at each end of a central spindle. On one end of this spindle is formed a screw, which fits a screw nut in one of the V rings or V arms, so that by turning the nut in either direction the V rings or V arms may be brought nearer together or forced further apart. By bringing the V rings nearer together the several plates comprising the core bar will be held firmly in their respective positions and will thus form together a rigid core bar, while by forcing them apart the plates will be allowed to fall inwards so as to admit of their being drawn out of the casting. The number of V rings or V arms, and corresponding V pieces on or connected to the plates may be varied to suit the different castings."

[Printed, 4d. No Drawings.]

A.D. 1862, April 10.—N<sup>o</sup> 1029.

CHRISTOPH, LOUIS, HAWKSWORTH, WILLIAM, and HARDING, GUSTAVUS PALMER.—This is an invention of a hydrostatic apparatus, applicable for drawing metallic tubes, rods, and articles, solid or otherwise, and designed as a substitute for the mechanical appliances ordinarily in use. The apparatus, vertically disposed on a suitable foundation, consists of a tall cylinder open at the top, from which the ram rises and carries, depending from a projecting flange, a circumposed series of gripper rods, and beneath these, respectively in direct vertical lines therewith, is a circumposed series of dies, set into an annular flange or plate cast laterally projecting from about the midlength of the cylinder; and corresponding vertically therewith at the base of the cylinder, the lower ends of the several mandril rods required in the operation to support the tubes internally, are fixed, their upper enlarged ends pointing upwards into and projecting through the dies. The ends of the tubes and articles to



be operated upon, are fixed respectively to the lower ends of the several upper rods, and the drawing is effected when water is forced into the cylinder beneath the ram, by the upward movement of the latter, which gradually rises and carries up the gripper rods, and these pulling simultaneously, draw the several tubes or articles attached to them through the dies.

[Printed, 8d. Drawing.]

A.D. 1862, April 11.—N° 1040.

GRICE, JAMES THOMAS.—This invention relates to the manufacture of what are termed twisted tubes, or tubes spirally fluted, or otherwise ornamented in a spiral form. The fluting or ornamenting of the tube is first effected lengthwise in straight lines in the ordinary way, the twisting thereof being a subsequent operation, preparatory to which it consists in:—

1st. Filling the tube with pitch, lead, sand, or other yielding substance, and then twisting it, one end being rigidly fixed in a suitable holder, whilst rotatory force is applied to the other, or the two ends may be fixed in holders, which are turned in opposite directions until the flutes and ornaments on the tube are twisted into the required spiral form.

2nd. Instead of employing as described above, a yielding material to support the tube internally during the twisting operation, using a small metal rod for the same purpose, such rod being as small in diameter as the smallest part of the tube is likely to be after the twisting operation.

[Printed, 4d. No Drawings.]

A.D. 1862, April 16.—N° 1102.

ROWAN, JOHN MARTIN.—(*Provisional protection only.*)—This is an invention of means for obviating or altering the porous condition to which articles cast in steel are found to be subject. It “consists in applying pressure by means of hydraulic apparatus, for example, to the cast steel in the moulds when in a “fluid or nearly fluid condition, such pressure consolidating and “greatly improving the cast steel, and also rendering it better “suited for subsequent treatment by hammering or rolling. “The term ‘cast steel’ is intended to include metal converted “by the pneumatic process.”



It is stated that the constructional arrangement of the apparatus required to practise the invention will "depend on the form and other peculiarities of each article. In the case of a railway wheel tyre, for example, the pressure may be applied by means of a conical centre piece formed with a flange, which shapes and compresses the flange edge of the tyre, the conical part at the same time forcing out segmental pieces against the inside surface of the tyre; or, the pressure may be applied solely to the flange edge, or solely to the inside surface of the tyre. In the case of an ingot or block designed for a gun and cast on end, the pressure may be applied by means of a plunger or false bottom forced upwards from below. If the casting is to be a short thick tube to be subsequently drawn into a long thin pipe, for example, the pressure may be applied by using a conical mandril and by forcing it further inwards. In other cases similar means will readily suggest themselves to the practical engineer. It will be obvious that in order to obtain an efficient pressure, the egress of the molten metal at the gate must be prevented by means of stopping details secured in connection with the hydraulic or other pressing apparatus."

[Printed, 4d. No Drawings.]

A.D. 1862, April 19.—N<sup>o</sup> 1146.

ROSE, WILLIAM.—This invention relates to the manufacture in iron or steel, or in the two metals combined, of barrels for fire-arms and ordnance, and of tubes. A strip or skelp of iron or steel is formed into a tube by passing it between grooved rollers or through dies at a draw-bench and if thought necessary the seam may be welded. This rough tube is then divided into short lengths of about one foot if intended for rifles, and for pistols and guns into proportionate lengths, and upon each is coiled a strip or ribbon of iron or steel; they are then after being heated to a welding heat in a suitable furnace, jumped up at the ends to close the coils and passed on a mandril through a train of ordinary grooved gun rolls, once, twice, or thrice as may be necessary. By this means the short tubes are drawn out, the edge of each coil is welded to the next, and the coils collectively are welded to the inner tube, the last passage of each tube through the rolls being made on a tapering mandril. If a greater degree of strength or thickness is required, the tubes may have additional bands coiled upon them again and be heated and subjected to the

combined welding and rolling process. Ordnance and heavy arms are made in the same manner, the rolling and other apparatus being appropriately stronger for dealing with heavier weights.

Tubes for other purposes are manufactured by the same process omitting the taper rolling excepting when taper tubes are required.

[Printed, 4d. No Drawings.]

A.D. 1862, May 20.—N° 1525.

FEWTRELL, EDWARD.—This invention relates to the manufacture of metallic tubes from tubular ingots or billets in a heated state, which are reduced and elongated by a set of three rolls, trigonally disposed in parallel position relatively, two of them side by side a short distance apart on a horizontal plane, and the third roller above, directly over the intermediate space formed between the other two.

The longitudinal configuration of these rollers constitutes the main feature of the invention, as the general construction of the machinery is not new. The axes of the rollers are mounted in suitable side frames or "holsters," through which, in a direct line with the space longitudinally formed between the three rollers in the direction of their length, are openings, through one holster for admitting the tubular ingot, and through the other for its exit after having been passed through the rolls on a suitable mandril. The external form of the rollers as shown by the drawing is convex, there being towards their midlength a sudden inclining circumferential enlargement, which gradually decreases towards the end. All the rolls have the same form, which may be modified, and they are caused to rotate in the same direction, by a tooth wheel fixed on the axis of each and working into a central wheel that is set in motion by the driving apparatus. Suitable guides at one end are provided for directing the passage of the ingot between the rollers when the mandril is forced forward at a regulated speed by a screw, also at the opposite end to receive the tube after it has passed between the rollers. Iron and steel are rolled in a heated state, brass may be rolled cold, and copper or Muntz's metal either in a cold state or heated.

[Printed, 10d. Drawing.]

A.D. 1862, May 28.—N° 1607.

JOHNSON, JOHN HENRY. — (*A communication from Charles Felix Seville.*)—The object of this invention, which relates to the manufacture of lead pipes by hydraulic pressure, is to improve the system by tinning or applying one or more layers or coatings over the surface of the pipes, externally and internally during the process. "This is accomplished by having a reservoir of molten tin placed above the tinning tool, so as to supply the tin constantly thereto. The tin is introduced to the interior of the pipe by an opening in the mandrill, which regulates the diameter of the same, the tin being applied continuously as fast as the tube is made, either to the interior or exterior thereof. By this system tinned tubes may be obtained of any indefinite length, whilst by the ordinary method it is necessary to cut the pipe in order to introduce a fresh supply of tin when the first is expended. The thickness of the tinning for pipes of all diameters depends . . . on the number of coats or layers of tin which are applied one over the other, and consequently facility is afforded for applying a covering or lining of tin of any thickness desired."

[Printed, 4*l*. No Drawings.]

A.D. 1862, June 2.—N° 1661.

KEY, JOHN and POTTS, FERDINAND.—This invention relates to a process of ornamenting, by means of rollers having suitably shaped grooves and designs cut or engraved upon them, iron bars, rods, strips and pieces used in the construction of iron bedsteads and articles of furniture, and for other purposes; also to the ornamenting of tubes and pipes by the same process. The grooves variously shaped or the designs appropriately suited to the article to be ornamented, are formed "on the peripheries of the rolls through or between which the iron passes at right angles to the axis of the said rolls to be finally finished, so that after such rods, bars, or strips of any section have been reduced by the common and ordinary process of rolling to as near the shape required to assume when finished, we then while yet hot, or after it has been again heated, pass such rods, bars, or strips, through rolls ornamented on their peripheries or surfaces, that as the heated iron is being passed between them, the design so formed on the roll or rolls shall be reversely transmitted to the

“ iron so treated, and of which we purpose making or forming  
 “ the suitable parts that it may be desirable to ornament of bed-  
 “ steads and other metallic articles to which iron so treated may  
 “ be applicable.”

“ Iron welded tubes while yet hot from the process of welding,  
 “ or reheated if required, may with great advantage be passed  
 “ through rolls to be ornamented, and such kinds of tubes are  
 “ used extensively for lighting and other purposes in public  
 “ buildings . . . . . either as a cornice, moulding or otherwise,  
 “ and such tubing thus treated may be used for a variety of  
 “ purposes.”

[Printed, 10d. Drawing.]

A.D. 1862, June 17.—N<sup>o</sup> 1790.

NIELD, JOHN, and NIELD, THOMAS ARTHUR.—This invention relates to the moulding process in the manufacture of cast metallic pipes having faucets and with or without snugs, or flanges with or without margins or brackets, also cylinders, columns, or shafts, solid or hollow, and round, polygonal, or of other transverse configuration.

“ The patterns are placed half way through a frame constructed for the purpose, which frame stands in a vertical position, and is fitted with pins to guide the moulding box to its place; the pattern or patterns are held by hinges, or adjusted to their places by pulleys and slides, or other contrivance, so as to be drawn out by hand or machinery, the said patterns being held in their places by pins fixed for that purpose during the process of ramming. The frame may be so constructed as to admit of pipes or articles of different diameters being moulded, and one or more articles at the same time. The boxes are made to hold one or more pipes or other articles, and are cylindrical or of any other required form, but they are made in halves longitudinally, and are perforated to allow the escape of gases and steam, and have flanges at the top, bottom, and sides. In the inside of the boxes are flanges or ledges to keep the sand from falling out. The flanges on the sides are to fasten the half boxes together, and the flanges at the bottom are to fit on the seating plate, which plate can be made to answer for different sizes, either of socket or flange pipes. The bottom flanges are moulded in the recesses of the



“ plate, which recesses are perforated, hoops being made to fit the seating for different sizes of pipes. The parts of the frame, boxes, and seating which come in contact are faced to fit true to each other. The core barrel has a hoop at each end to enable the cores to be made true, the hoop at the bottom being tapered to fit the seating. This system may be applied to either dry sand or green sand moulding.”

[Printed, 10d. Drawing.]

A.D. 1862, July 16.—No 2037.

SELBY, GEORGE THOMAS.—This invention relates to the construction of tubes which have increased thickness along one side, and also to tubular apparatus designed for superheating steam. This apparatus consists of a series of tubes coiled spirally and disposed side by side, their ends, top, and bottom, being, by screwing or otherwise, set into or connected to two pipes, which, in the process of manufacture, are formed with additional thickness on one or two sides, in order that the lateral connections made at intervals respectively with the ends of the spirals, may have more substance of metal than the ordinary uniform thickness of a pipe or tube affords. The effect is produced on the tube during the rolling process; “the inside should be supported by a mandril, such as is used for welding iron tubes, and the rolls may be a set of 2, 3, or 4, similarly constructed to those now used for welding iron tubes, with this difference, that on one roll or on all the rolls, or on opposite rolls, a groove is made to correspond with the shape and thickness desired to be given to the outside of the tube or tubular article, and the mandril must be shaped to give the desired internal form and thickness to the tube or tubular article; but I prefer to give the desired extra thickness by partially fixing externally or internally, or both, either by welding at the ends or by rivetting, a flat or suitably-shaped piece of iron on an ordinary tube, and then passing the whole at a welding heat through grooved rolls, as above described, so as to weld the whole length of the piece or pieces of metal on to the tube.” These thick-sided tubes may be variously applied and made to any required transverse form suitable from bridge and roof girders, pillars, and other structural purposes.

[Printed, 8d. Drawing.]

A.D. 1862, August 15.—N° 2303.

NEWMAN, JAMES.—(*Provisional protection only.*)—This invention, relating to apparatus employed in the manufacture of metallic tubes, has for its object the drawing of several tubes simultaneously by one drawing-head or bench, in place of drawing such tubes singly as heretofore, the process it is stated being particularly applicable to the drawing of thick tubes suitable for the construction of locomotive and other steam boilers. The inventor says:—"In place of connecting each tube and mandril  
" (where a mandril is used) to a separate draw chain or other  
" draft instrument, I cause a series of tubes with their mandrils  
" (when such tubes are of comparatively small diameter) to be  
" connected in any convenient manner to a draw bar or cross  
" head which moves to and fro on fixed guides. Motion is given  
" to the draw bar or cross head by a chain or otherwise in order  
" to draw the tubes through the openings in the draw-plates,  
" which are fixed and arranged in a series to correspond with  
" the tubes, such draw-plates being of the ordinary construction."

[Printed, 4d. No Drawings.]

A.D. 1862, August 29.—N° 2400.

DYSON, GEORGE WALTER.—This invention relates to machinery designed for polishing circular metal rods, bars, and shafts of metal, and is also applicable to the finishing and polishing processes in the manufacture of metallic pipes and tubes. This machine operates by means of a pair of short polishing rollers, horizontally disposed to revolve between suitable housings or side frames, wherein the bearings for their axes are so placed as to throw the rollers relatively out of a vertical plane, so that the axial line of one roller crosses the axial line of the other at a very acute angle. The driving apparatus is placed apart at some distance, the intermediate space being occupied by the coupling spindles and boxes, which are necessarily arranged to transmit rotary motion to the rollers respectively in indirect lines, both rollers rotating in the same direction. The rods, bars, tubes, and articles are introduced between the rollers in the direction of their length, and they are caused to take a direct mean line between the axial lines of the two rollers, by means of roller guides. The rollers act by pressure and friction combined, the former regulated by setting down screws applied to the ends of

the axis of the top roller, and the latter by reason of the rollers rotating respectively in the same direction at different acute angles across and in frictional contact with the opposite sides of the rod, bar, or tube under operation.

[Printed, 10d. No Drawings.]

A.D. 1862, September 8.—No 2470.

CROSLAND, JAMES STEAD.—(*Provisional protection only.*)—The object of this invention is to improve the process of manufacturing tubes of brass, bronze, copper, and other copper alloys, by casting such tubes in metal or dry sand moulds which are prepared in a heated state, and placed either vertically or inclining, the dry sand or loam cores being also heated and supported in the required position in the mould by chaplets or thickness stops. The metal is poured into the top of the mould through a closed gutter or channel 2 or 3 feet deep, which is allowed to fill, and when cold this part is cut off the tube, which is then fit for use, and if required may be turned in a lathe. When tubes adapted to steam boilers are cast in what is called bell or gun-metal (which is too hard for rivetting into the tube plates), a hoop of soft brass is brazed upon each end of the tubes, and by this means the rivetting is effected, and the ends of the tubes are thereby fixed in the plates.

"Tubes manufactured by this improved process of gun metal, bell metal, or bronze are admirably adapted for engineering purposes, and they are applicable in many cases where brass, copper, and iron tubes are found totally unfit from their perishable nature."

[Printed, 4d. No Drawings.]

A.D. 1862, September 26.—No 2626.

DIXON, EDWIN.—This invention relating to the manufacture of welded iron tubes, refers to the arrangements in connection with a single draw-bench, which is contrived to draw and weld two tubes simultaneously; also to the furnaces employed. The axis of the forceps which are drawn along the bench by the chain is fixed into the top plate of a small waggon or slide, and when coming into action the two jaws of the forceps close against the two opposite sides of a double claw, which is fixed to the waggon top. By this means two skelps at a time can (at a welding heat) be drawn direct from the furnace through two sets of dies or pin-



cers, and formed and welded into tubes at one operation of the machine. The skelps are, previous to the drawing and welding operation, placed in a preparatory furnace, which constitutes the flue from the welding furnace. Thence they are transferred to the oven of the welding furnace, which is contiguous to and in a direct line with the draw-bench.

Furnaces so constructed "are more convenient than ordinary furnaces, and are productive of less discomfort to the workmen."

[Printed, 1s. Drawings.]

A.D. 1862, October 22.—N<sup>o</sup> 2848.

FEARN, THOMAS.—This invention, relating to the construction of rods, poles, and tubes, refers more particularly to the manufacture and ornamentation of such tubular and solid articles as are required for cornice poles, bedsteads, and other articles of furniture. It consists in coiling round a tubular or solid core or base of metal, wood, paper, or other suitable material "a strip or riband of thin metal, such, for instance, as brass or gilding metal. The core or base may be japanned, enamelled, or otherwise decorated before it receives the coil or twist, in which case a portion of the surface of the core may be left exposed; or the core may be left rough, and the strip or band may be ornamented with an embossed or engraved enrichment, and coiled closely upon the core or base, thus producing a very rich and elaborate appearance at a low cost."

[Printed, 4d. No Drawings.]

A.D. 1862, October 25.—N<sup>o</sup> 2875.

BROWN, DAVID, and BROWN, WILLIAM.—(*Provisional protection only.*)—This invention relating to the rolling machinery employed in the manufacture of gun barrels, cannon, and other articles, consists in imparting an intermittent rotary motion to the rolls, which are at intervals brought to rest for the purpose of making the introduction between them of the gun barrel or article more facile. The gun barrel or article is placed upon a table in front of the machine, which table by means of cranks on the axis of one of the rolls has a to-and-fro motion imparted to it, and by this means the barrel is presented and seized by the rolls at the proper point in their rotation. The intermittent motion is given to the rolls by means of a tooth wheel which is placed to run



loosely on the axis of one of the rollers and acts as a driving wheel, it having a limited portion of its circumference void of teeth.

[Printed, 4d. No Drawings.]

A.D. 1862, October 25.—N° 2877.

CLARK, WILLIAM.—(*A communication from Richard Chester Robbins, Jesse Moore Kean, and Henry Samson Case.*)—This invention relating to the formation of the connecting joints of cast-iron gas and water mains, and other socketted pipes, consists in introducing into a recess in the socket of such pipes an annular lead packing, into which the other or plain end of a pipe is forced, and by compressing the leaden packing between the internal surface of the recess in the socket and the external surface of the plain end of the pipe which is inserted, forming a secure joint. The annular recess in the socket is formed by a projection on the core when the pipe is cast, and the annular lead packing is cast into this recess through a hole, which is drilled through the metal of the socket from the outside, a metal mould in two pieces being temporarily placed inside the socket to prevent the lateral spreading of the melted lead, and to impart to it internally a smooth surface. Externally the plain end of each pipe is made smooth and slightly tapering during the casting process by means of a short tubular cap or collar, which is bored smooth and slightly tapering, and when placed in the moulding sand, forms a short continuation of the mould. The plain smooth end of one pipe is forced into the packing ring in the socket of another by two long screws, which pass through the ends of a cross head that abuts against the extreme end of the socket of one pipe, and screw into a yoke which embraces the other pipe and finds a supports against the back shoulder of its socket. The mouth of the socket of each pipe may be enlarged to admit a caulking tool, to be used if found necessary. The trenches for laying these pipes may be dug to a uniform breadth, and need not be made wider where the joints of the pipes occur.

[Printed, 8d. Drawing.]

A.D. 1862, November 3.—N° 2962.

TUSSAUD, FELIX.—This is an invention of a new arrangement of a machine, designed for dividing or cutting lengthwise or in curves, sheets of metal, card-board, leather, and other materials of

great width and length; also for cutting out parts of such sheets in any required curved or round form or shape, and for cutting the ends of pipes. "For cutting in the middle of sheets of metal or other material, the ordinary circular cutters, having their edges bevelled or not, as required, and slightly crossing each other as usual, are mounted at the extremity of two long shafts or axles suitably supported, the length of the axles varying according to the length of the sheet to be cut. A way or groove is formed in the framework of the machine for the passage of the cut metal or other material, so that with a machine of small dimensions, large sheets of metal or other material may be divided in the middle. For cutting curved forms of small or large radius, the upper cutter is vertical and is worked by the motive power, the axles of the lower cutter are independent of the mover, and are articulated so as to be adjustable at any angle to the upper cutter."

"If the upper cutter is placed vertically, and the lower one horizontally, it will be easy to cut out small circumferences, but if on the contrary the lower cutter is made to take all the angles existing between the horizontal and vertical lines, it would be in the best positions for cutting all kinds of circumferences. 'This arrangement permits of cutting a notch in a plate and of preserving the washer at the same time.'"

For cutting the ends of pipes the arrangements are modified; the parts for adjusting the angle are not required, and cutters differing in diameter are used according to circumstances, the lower cutter which in some instances is permanently fixed, being the smallest.

[Printed, 8d. Drawing.]

A.D. 1862, November 5.—N<sup>o</sup> 3001.

LAVEISSIERE, JULES JOSEPH.—The object of this invention is to improve the manufacture of tubes made of copper or other metals or alloys. It relates to the process of coating the tubular ingots, and to a subsequent rolling process whereby they are reduced and lengthened out.

"In order to obtain a sound hollow ingot or cylinder of the metal or alloy, I run into a mould of the shape required for the exterior of the ingot the requisite quantity of the melted metal or alloy, it being either poured in at the top or run in at the side or bottom, and as soon as the metal or alloy has nearly,

" but not completely set, a mandril is forced down into the metal ;  
" this is effected by means of a screw or otherwise. The mandril  
" is not, however, forced quite to the bottom of the mould, so  
" that one end of the ingot will be closed, or it may be made with  
" an internal flange only at its end. The metal is thus compressed,  
" and the volume displaced by the mandril is caused to rise up  
" around the core, and to fill the mould. As soon as the metal  
" or alloy is sufficiently set to retain its shape, the mandril is  
" raised from the mould."

" In order to draw out the hollow ingots into tubes, I employ a  
" system which allows of the metal being worked either hot or  
" cold; this system consists in employing grooved rollers, between  
" the grooves of which the ingot is either pushed or drawn by a  
" mandril forced or drawn forward in any suitable manner; and  
" in order to be enabled more quickly and regularly to draw  
" down the tube, I employ two sets of rollers placed close together  
" one after the other, the axes of one set being vertical and the  
" other horizontal. The grooves in the second set are also made  
" smaller than the grooves in the first set; the tube will thus  
" nearly simultaneously be nipped by the rollers in the two direc-  
" tions. After the thickness of the tube has been by this means  
" considerably diminished, the tube is completed by being drawn  
" through dies in the ordinary manner."

[Printed, 1s. Drawings.]

A.D. 1862, December 5.—N° 3262.

CHRISTOPH, LOUIS, HAWKSWORTH, WILLIAM, and  
HARDING, GUSTAVUS PALMER.—This invention relates to  
apparatus designed for drilling, drawing, and rolling metals.

1st. The drilling apparatus, wherein is mounted a number of  
stationary drills, which are caused to operate simultaneously on  
several pieces of metal, to which, instead of to the drills, a rotary  
motion is imparted.

2nd. The drawn-bench employed for drawing metals either in  
a hot or cold state has in lieu of the ordinary drag chain, a screw  
spindle; the holes in the draw plates are conical, and the plates  
are made thicker than ordinary. When tubes are drawn, their  
ends may be held by screw grippers. For ordnance it is proposed  
to draw and expand one tube inside another by the aid of an  
internal mandril. It is also proposed to draw or roll tubes on a



mandril, capable of extension and contraction, in order that it may be easy of withdrawal.

Another system of draw-bench is designed to operate by means of a horizontal double-action hydraulic press. The "wordles" are fitted into flanges on the respective cylinders, and the grippers are secured to a flange projecting at the mid-length of the ram, there being two sets of wordles, grippers and mandrils, acting alternately.

3rd. Rollers for rolling metals instead of being made solid in one piece, are composed of a number of discs of chilled cast-iron or tempered steel, closely packed side by side on an axis or spindle, the combined peripheries of the discs, having the form of a grooved roller. This mode of construction permits the use of tempered steel rollers, and saves expense in case of injury, as a damaged disc could easily be removed and a perfect disc substituted in its place.

[Printed, 2s. 2d. Drawings.]

A.D. 1862, December 29.—N° 3462.

**RIDDELL, JOSEPH HADLEY.**—This invention relates to the formation of the flanges of cast metal pipes, with a view to their connection, and consists in forming on the meeting surface of each flange an annular groove semicircular or otherwise, to receive a packing ring similar in form and composed of vulcanized india-rubber, hemp, or other suitable elastic material. The grooves in the flanges must be of corresponding size, so that one half portion of a packing ring may lie and be compressed in each, when the flanges are drawn together. This arrangement is not open to the objection which has been raised against flat packing rings which, when employed are interposed between the flat meeting surfaces of the flanges of the pipes, and consequently are liable to lateral derangement, caused by the pressure of the steam or water in the pipes. The flanges of pipes instead of being as usual round, are made square with rounded corners, and the holes for the connecting bolts are made through the parts which form the angles.

[Printed, 8d. Drawing.]



1863.

A.D. 1863, January 15.—N° 128.

**HULSE, WILLIAM, and HAINES, CAMPBELL LLOYD.**—This invention relates to machinery or apparatus designed to effect the bending process in the manufacture of tapering metallic tubes from sheet metal previously cut to the required form.

A tapering "mandril of the size of the taper tube to be made has a straight narrow slot made in its whole length, the said slot having the depth of about half an inch. The said mandril fits in a bed which covers the lower half of the said mandril, and a cover which partly covers the upper half of the said mandril is capable of being fixed upon and removed from the before-mentioned bed. When the mandril is enclosed by the bed and cover about three-fourths of the said mandril are covered. The mandril is capable of being geared to driving mechanism, by which a slow rotatory motion is given to it. In using the machinery the taper mandril is placed in the bed, and the cover is fixed down. The edge of the sheet of metal to be made into a taper tube is introduced into the slot in the mandril and the said mandril is geared to the driving mechanism. As the mandril slowly rotates it draws the sheet of metal between the said mandril and the bed, and bends it into the form of an open jointed taper tube. The cover serves to hold down the mandril, and also helps to bend the sheet of metal. After the mandril has made about two rotations the figure of the tube is sufficiently perfect. The mandril being thrown out of gear with the driving machinery, the cover is removed, and the mandril lifted from the bed and the taper tube drawn from off it. The tube may be finished by soldering in the ordinary manner."

[Printed, 8d. Drawing.]

A.D. 1863, January 15.—N° 129.

**BARRACLOUGH, THOMAS CRITCHLEY.**—(*A communication from George Henry Sanders.*)—This invention relating to apparatus designed for cutting transversely through tubes and pipes composed of metal or of other indurate substances "consists of two metallic jaws, by preference made of malleable or other elastic description of cast iron or steel, and hinged together at one ex-

“ tremity and so formed near the hinge or joint as to receive the  
 “ pipe to be cut to right angles to the cutter employed ; to these  
 “ jaws at the further end to the hinge two steel or wrought iron  
 “ rods are attached. The cutter which is made of steel slides  
 “ vertically through one of the jaws, and its cutting force or pressure  
 “ may be adjusted by means of a thumb screw above it. The  
 “ pipe to be cut is placed in the hollow made for its reception, the  
 “ two opposite ends of the rods are then brought nearly together,  
 “ and secured by a link, links, or other substitute, the jaws being  
 “ thus caused to hold the pipe, and the cutter is tightened there-  
 “ upon. If now the pipe be held firmly in a vice, and the appa-  
 “ ratus turned several times round in a direction at right angles  
 “ to the axis of the pipe, the cutter will penetrate the material and  
 “ dis sever the tube. If the metal or substance of which the tube  
 “ is made be very thick, more pressure is to be applied gradually  
 “ to the cutter by means of the screw until it is cut through.”

[Printed, &c. Drawing.]

A.D. 1863, January 21.—N° 179.

WRIGHT, THOMAS. — (*A communication from Wm. Hainsworth.*)—(*Provisional protection only.*)—This invention relating to the manufacture of cast-iron pipes and to the apparatus employed, consists in :—

1st. The peculiar form of the core bar which, instead of being tubular, has a solid center whence project radiatingly, four or more longitudinal flanges or feathers, in the segmental spaces between which the sand will be retained ; cores so formed need not be subjected to the drying process.

2nd. Making the core box in three or more longitudinal parts hinged or jointed together, so that whilst being filled, all parts of the core are accessible, and when moulded, the core is easily removed from the box.

[Printed, &c. No Drawings.]

A.D. 1863, February 13.—N° 388.

JONES, JABEZ.—This invention relating to the manufacture of sheet lead, tin, and other metal from the metal in a molten state, consists in either forcing the metal out of the containing vessel through narrow slots or slits in its bottom or sides in the form of sheets, or forcing it out through suitable dies in a tubular form, (the containing vessel) instead of being as is usual, fixed as de-

scribed by this inventor in the Specification of his prior Patent dated December 26, 1861, No. 3229), is caused to rise by hydraulic pressure and move upon the piston or plunger, which is rigidly fixed above it. The sheets when requiring tinned surfaces are, whilst in a heated state, passed through a bath containing the tin heated to liquefaction. When the sheets are forced out of the container in the form of a tube, the latter is received upon a mandril and cut open by either a fixed or movable knife or saw, and is afterwards flattened out by means of rollers; the tinning operation when required, may be performed upon it either whilst it is in the tubular form, or in the subsequent flat state.

By the former invention the sheet metal is produced in the state of flat sheets and not in a tubular form.

[Printed, 8d. Drawing.]

A.D. 1863, February 20.—N<sup>o</sup> 465.

HAINSWORTH, WILLIAM.—(*Provisional protection only.*)—This invention relating to the manufacture of cast-iron pipes, columns, and tubular articles, refers to the construction of the core boxes and bars, and the formation of the cores in green sand. The core bar by preference having transversely the form of an irregular hexagon with two sides curved, is made, either solid or tubular, of wrought or cast metal or other suitable material, and furnished with projecting pieces or lugs to retain the green sand when it is pressed in and rammed between them, thereby dispensing with a baked core. The core box is constructed in three longitudinal parts, so that whilst making the core it is accessible throughout all parts of its length. The parts of the core box are formed internally to correspond and give to the core its required external configuration, the upper part of the box having a longitudinal opening to admit the sand, which is smoothed off to the curve requisite to correspond with the complete curvature of the core, by a "strickle." Air holes are formed in the sand by wire rods. The "prints" at the end of the cores are preferred to be of metal.

[Printed, 4d. No Drawings.]

A.D. 1863, February 21.—N<sup>o</sup> 472.

THOMPSON, ROBERT.—(*Provisional protection only.*)—This invention relating to moulding apparatus, is particularly adapted to



the moulding of socket pipes, which are to be cast in a vertical position with the socket downwards; it may also be applied to the casting of other articles.

"In moulding socket pipes of large dimensions the core barrel is made in two parts, connected by a taper joint, the larger diameter for the interior of the socket being attached to or cast with the body of the truck usually employed for facilitating the transport of the mould into and out of the drying stove. The moulding box is or may be made in two parts; the lower portion containing the socket is connected to the truck and to the plain portion for the body of the pipe by studs and pins. The larger part of the core is made by means of a strickle board, and the remainder of the core is made in the usual manner. In moulding the pipe the larger portion of the pattern is fixed to a separate truck, and the sand is rammed into the lower portion of the box. A short cylinder, as now customary, is employed for moulding the remainder of the pipe."

[Printed, 4d. No Drawings.]

A.D. 1863, March 20.—N<sup>o</sup> 745.

NIELD, JOHN, and NIELD, THOMAS ARTHUR.—This invention relates to the construction of collapsible core bars, which are made in three or more longitudinal segmental sections hinged together to form the shell of the bar, the marginal sides of the two outermost sections being suitably inclined to make a lap joint when extended to the position which forms the full size of the bar. Through the interior of the bar or barrel there is a central axis or shaft whereon, respectively at its mid-length and at its two ends, it has fixed three tappet cams, which engage with suitably curved lugs fixed projecting from the internal surface of the segmental sections respectively, and which when the axis is turned in one direction are forced outwards, and collectively form the perfect core bar, and when turned in the other direction are allowed to collapse. At each end of the bar or barrel there is a circular plate which covers the cams, and when the sections of the shell are expanded they are kept in position to receive the covering of loam by a steady pin. When pipes are moulded to be cast with the socket end uppermost, the longitudinal sections of the shell of the core bar may be shaped to form the necessary enlargement of the core, otherwise two metallic hoops may be



employed, one solid and the other split, and which are required when the sockets of the pipes are made at the lower ends.

[Printed, 8d. Drawing.]

A.D. 1863, March 25.—N° 784.

GOPE, THOMAS WILSON.—(*Provisional protection only.*)—This invention relates to a mode of connecting together the ends of metal, earthenware, and other pipes which are made with flanges, by means of a grooved coupling or collar made in two semi-circular halves or parts, and grooved internally to receive the flanges, between and about which, if necessary, washers, cement, or packing may be employed to make the connection fluid tight. The two halves of the collar embrace the flanges, the edges of one half being made to fit the edges of the other half when they are placed together, and may be secured by clamps.

[Printed, 4d. No Drawings.]

A.D. 1863, March 30.—N° 819.

HUGHES, HESKETH.—This invention relates to an apparatus adapted to the shaping of metals and plastic substances, and to shaping or ornamenting thin metallic tubes. The effect is produced on the article under process in some cases by a pair of rollers, which are mounted relatively in planes slightly or not deviating from parallel. The circumferential surfaces of these rollers have corresponding spiral grooves winding round them from end to end, and by means of tooth gearing they are both driven at a uniform speed in the same direction. The metal or article to be shaped is passed between them in the direction of their length, their distance apart being adjustable to suit articles of different sizes, which are kept directly between the rollers by side guides, and are gradually advanced intermediately along them from end to end by the united action of the spiral grooves.

The constructional arrangements of the apparatus (in which for some purposes three rollers are employed) differs in accordance with its intended use. A machine designed for shaping iron is described and shown; another for shaping polygonal headed bolts, pins, and rivets; a third suited for operating on plastic substances, such as medical pills; and a fourth machine is exhibited and described as adapted to producing an ornamental

effect on thin tubes, which are supported during the process by a filling of lead, that is afterwards melted out.

[Printed, 10*d*. Drawing.]

A.D. 1863, April 2.—N<sup>o</sup> 846.

LAW, JOHN WARREN, and INGLIS, JOHN.—This invention relates to the application of pressure to the sand employed in the moulding boxes engaged in the manufacture of cast-iron and other metal pipes, and of other articles of cylindrical, spherical, or other form. The main features of the invention consist in ascertaining the additional quantity of sand required to compensate for compression, and in the compressing and moulding apparatus.

The moulds for casting pipes are made in two longitudinal parts or halves, which during the moulding operation are laid on a table or carriage on rails, the sides of each half part of the mould being raised by one or more frames adapted to the purpose, the depth of these frames determining the extra quantity of sand required. The compression of the sand may be effected by hydraulic pressure, eccentrics, levers, screws, or otherwise, but the mode preferably employed consists of a kind of press that operates by means of a series of toggle-jointed links or levers, which in united action possess a gradually increasing force. The press may be actuated by levers or racks, or by the direct action of steam. The pattern is combined with a parting plate, and it may be so arranged as to be capable of being turned on its axis when in the mould, for the purpose of imparting to the latter a smooth surface. When the moulds are required to be dry they are passed in a horizontal position on carriages through a stove, and when dried they are drawn out and received upon a movable frame, so contrived that it will tilt the mould into an inclined or other position most convenient or desirable for the casting operation.

The manner of moulding the concave side of a railway sleeper is also described.

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1863, April 24.—N<sup>o</sup> 1023.

THOMPSON, JAMES.—This invention relates to the manufacture without weld or joint, and with a solid breech, of barrels for fire-arms and other kinds of tubes with solid parts, also to the

machinery employed. These barrels and tubes are made by drawing out solid tubular billets by first passing them through ordinary preparing rollers, and then by means of rollers specially grooved and formed for the purpose they are brought to the required form and size, the metal being heated if of the nature to require it. These rolls are "formed with a double collar in  
" one or both sides of the groove, or with a collar and a bearing.  
" A stop piece is fitted into the groove, against which stop the  
" roller places the end of the barrel or tube, this stop also acting  
" as a guide to indicate when the barrel is to be put in the rolls,  
" and governing by its position in the rolls the length of barrel  
" or tube. At any suitable point in the periphery of the grooves  
" of one of the rolls a sinking is formed to shape the breech or  
" solid part of the barrel or tube, and as the barrel requires  
" turning in the direction of its circumference after every rolling,  
" an opening is cut through the bearing of the roll to admit the  
" breech or solid part, which is thus forced against the collar and  
" against the stop, and shaped."

Instead of using as a preparatory operation the ordinary rolls, the billets may be from the first reduced and lengthened out by passing them through a succession of grooves made in rollers formed as above described.

[Printed, 8d. Drawing.]

A.D. 1863, April 24.—N<sup>o</sup> 1024.

THOMPSON, JAMES.—This invention relates to a process of punching by means of a steam hammer, the central hole in the ingots or blanks of steel, iron, or other metal employed in the manufacture of gun barrels, pipes, and other similar articles, such ingots or blanks being after the punching operation subsequently heated and subjected to the usual rolling, swaging, or drawing process, whereby they are elongated and gradually reduced transversely to the required size. A strong steel punch of suitable form is fitted into the hammer head, and in the anvil there is a die or opening, wherethrough passes the plug or piece of metal which is forced out of the ingot by the punch when the hammer strikes, the ingot or blank being fixed in position on the anvil by a guide apparatus, is released, after being perforated by the punch by means of a lever below the anvil block.

[Printed, 8d. Drawing.]



A.D. 1863, April 24.—N<sup>o</sup> 1025.

**SHAW, WILLIAM ANTHONY.**—This invention relates to the manufacture by means of hydraulic pressure of lead pipes, which receive a substantial lining of tin or tin and its alloys during the operation. A tubular ingot of tin is placed in the cylinder of the press within a tubular ingot of lead, and the metals are simultaneously forced out over a central mandril through an annular die. The ingots may be first cast separately and placed one within the other in the cylinder, or the lead may be first cast in the cylinder round a core formed to the size of the tin ingot, and when this core is withdrawn, the tin may be cast into its place around a core or mandril corresponding to the size of the bore of the finished pipe. By this process it is stated, a perfect tin tube is formed within a lead pipe, the two metals being firmly united. The thickness of the tin lining may be regulated by the relative sizes of the ingots. It is preferred to work off only about two thirds of the contents of the cylinder before adding a new charge.

[Printed, 8d. Drawing.]

A.D. 1863, May 23.—No. 1300.

**POTTS, FERDINAND, and KEY, JOHN.**—This invention relates to the manufacture of metallic tubes, and to producing on such and other tubes an ornamental metallic covering.

1st. The tubes are made from metallic bands, termed "hoop iron" which is by the ordinary process rolled to the proper width, and before the metal cools it is, in order to give it the tubular form, conducted from the finishing rolls through a draw plate, or between the jaws of a pair of pliers, such as are in common use for the purpose. By using the rolled hoop iron, all the trouble and expense of gauging, cutting and preparing strips, or bands from sheets of metal is avoided, and much expense is thereby saved in the manufacture of tubes, the seams of which may be welded or otherwise.

2nd. Encasing such and other tubes and articles in ornamental covers, of any suitable metal or alloys that will permit of being worked in a heated state, iron excepted. These covers or cases consist of a suitable divisional number of thin longitudinal bands, each forming a segmental section of the tube to be covered, such bands having designs in relief produced upon them by rollers engraved and prepared in the same manner as embossing rollers,



and producing a similar effect. The several bands or sections are placed in position and kept bound on a tube by coils of wire whilst their edges are soldered thereto or together, and tubes thus ornamented may be lacquered and finished by any of the processes in ordinary use.

Metallic sash bars, frames, fittings, and other articles may be ornamented with coverings prepared, finished and applied in the same manner.

[Printed, 10d. Drawing.]

A.D. 1863, June 17.—N° 1517.

SPENCER, JOHN FREDERICK.—(*Provisional protection only.*)

—This invention relates to the making of "steam, gas, and water tube joints," or fixing the ends of tubes in the holes of tube plates, such holes being drilled or otherwise truly made, in size somewhat larger than the external diameter of the tube, and slightly tapering to admit of the introduction of a ferrule, which is forced or driven in between the end of the tube and the plate so as to fill the annular space formed between them by the difference of size. The ferrules employed for this purpose may be made of either iron, steel, gun or other metal suitable to be brought into close contact with the exterior of the tube ends, respectively and the metal of the plates, and they are formed with a shoulder or bead at the outer end if required, to permit of being drawn out from between the end of the tube and the hole in the plate, when necessary for repairs or otherwise, by means of a fork-like instrument or suitable lever tool, designed and employed for the purpose. The thickness of these ferrules, their diameter, length, and the substance of the enlargement or bead, will vary according to the relative sizes of the tube ends and the size of the holes in and thickness of the plates, the object being a simple, cheap, and durable mode of fixing tubes. The ferrules are available for re-use after having been withdrawn.

[Printed, 4d. No Drawings.]

A.D. 1863, June 17.—N° 1519.

DE WILDÉ, FÉDOR.—(*A communication from Professor Dr. Henry Schwarz.*)—The object of this invention is to preserve from corrosion the surfaces of leaden pipes and cisterns exposed to the alternate action of water and the atmosphere, by trans-

forming such surfaces into an insoluble sulphuret or sulphide of the metal, the metallic impregnation of the water being thereby prevented. The object is effected by a solution of any metal taken in combination with sulphur, that is, the soluble sulphides or sulphurets, "such as the sulphides of ammonium, potassium, sodium, lithium, barium, strontium, magnesium, calcium or the hyposulphites of these bases and other metals as aluminium, zinc, iron, liver of sulphur, or the reduced sulphates may also be used. By preference I take a solution of caustic potash or soda, and boil with an excess of sulphur so long as any sulphur is dissolved. In a solution containing 2 to 5 per cent. of a solid sulphuret heated to 212° Fahr., the articles to be treated are immersed, and whilst the process is going on they should be agitated or the solution kept in circulation; and for coating lead pipes internally two boilers are contrived to pour the solution to and fro through the pipes alternately from one boiler to the other, each being elevated by turns, and so placed and connected to the pipes by flexible india-rubber tubing, that the alternate direction of the current is conducted and flows therein. By this means any length or number of lengths of pipe may be operated upon simultaneously. The solution may also be applied by brushing it on to the interior surface of cisterns and other articles.

[Printed, 1s. Drawings.]

A.D. 1863, June 19.—N° 1541.

NEWTON, WILLIAM EDWARD.—(*A communication from Augustin Henri Hamon.*)—(*Provisional protection only.*)—This invention relating to the construction of leaden pipes, consists in casting within such pipes a lining of tin or other metal or alloy, not liable to be effected by any liquids conveyed by and passing through pipes so lined, and therefore not injurious to health. The leaden pipe is heated, and the bore of the pipe preserved by a core, the diameter of which is smaller than the internal diameter of the pipe, so that when the core is concentrically placed within the pipe an annular space is formed between them. Into this space the tin is poured, and being in a molten state it readily adheres to the lead. The pipe may then be drawn down in the usual way, the result being a leaden pipe with a lining of tin.

[Printed 4d. No Drawings.]

A.D. 1863, June 27.—N° 1618.

CHATTERTON, JOHN.—This invention relates to a method of lining tubes and hollow vessels made either of iron or other metals or substances capable of resisting pressure, with lead or other soft metal or alloy, or with gutta percha or other substance or composition capable of being reduced to a plastic state by the application of heat, the lining being expanded and forced into intimate contact with the internal surface of the pipe or vessel, by pressure applied internally.

The mode of operation depends upon the nature of the tube to be lined, and the substance employed for lining it. For the purpose of lining iron tubes with lead, a thin leaden tube is employed; this tube is slid into the iron tube and afterwards expanded by a mandril which is drawn through by the appliances of a draw-bench, or forced through by hydraulic pressure the mandril being furnished with a cup leather, the end of the tube which is put into communication with the pump, being closed by a cap.

When lining tubes or hollow vessels with thin tubular substances capable of being rendered plastic by heat, the thin tubular lining substance is placed within the tube to be lined, and when closed at both ends is expanded by hot water, which is forced inside it by a pump. The lining when cold resumes its normal rigidity, but permanently retains its increased diameter, being in intimate contact with the internal surface of the pipe.

The invention also relates to the manufacture of corrugated tubes made of gutta percha and other similar substances.

[Printed, 4d. No Drawings.]

A.D. 1863, August 7.—N° 1950.

MULHOLLAND, FREDERICK GEORGE.—(*Provisional protection only.*)—This invention relates to the casting of pipes, and to connecting such pipes by means of a tubular collar or coupling which is made with an internal annular recess to contain an elastic composition that covers and makes an expansible joint.

The pipes are cast of uniform diameter throughout and when brought together end to end, the collar is slipped loosely over the junction where the ends lap, the end of one pipe being recessed internally, and the end of the other externally, in each pipe one half of the thickness of the metal. The composition in a fluid or



semi-fluid state, is poured into the internal annular recess of the collar through a cup-formed orifice, and forms an elastic packing completely surrounding the joint.

The ingredients employed for forming the composition when it is required for low temperatures, consist of vulcanized india-rubber 60·0 parts, of resin and tallow 35·0 parts, of shoddy or fluff, 3·5 parts, and of prepared phosphorous 1·5 part. For high temperatures the above proportions are modified. The three first named substances placed in a suitable vessel, are subjected for the space of 4 or 5 hours to a temperature of from 260 to 290° Fahr., and when thoroughly incorporated, the phosphorous is added to prevent the decomposition of the india-rubber.

[Printed, 4d. No Drawings.]

A.D. 1863, September 9.—N° 2217.

GLYDON, WILLIAM, the younger. — (*Provisional protection only.*) — This invention relating to machinery and apparatus adapted to the manufacture of metallic pipes and hollow cylinders, refers to the cores and core bars employed in the casting processes, and to the manner of forming the grooves in the pairs of rollers employed in the rolling process.

1st. The core bars are made according to two plans, each capable of contraction. One plan consists in rolling up or bending a sheet of metal into a tubular form, the edges overlapping but not fastened together, or instead of using a bent sheet, the core bar may be cast in a similar form with one longitudinal division or slit. The other mode of construction consists in forming cylindrical or other shaped core bars by a number of longitudinal segmental sections, kept relatively in place by a hoop placed externally on each end of the bar, and severally forced outwards by springs, which act against snugs or convex ribs from the inside.

2nd. The rolls of rolling machinery are constructed in pairs, the rollers of each pair respectively having corresponding grooves, and the grooves of each successive pair having in relation to the grooves of the others a diminished size progressively. The grooves of the first pair (which are the largest), are indented slantingly crosswise; the grooves of the second pair of rollers are fluted longitudinally; those of the third pair have a series of irregular projections; and the grooves, which are smallest in the last pair of rollers, have the ordinary form. As the tubes and



cylinders pass through the rollers in succession on a mandril, a kind of kneading of their metallic surface takes place by means of the indentations, flutes, and projections in the grooves, making the metal homogeneous, and rendering a subsequent hammering process unnecessary.

[Printed, 4d. No Drawings.]

A.D. 1863, October 17.—N° 2549.

**MONCKTON, EDWARD HENRY CRADOCK.**—This invention relating to a mode of uniting or joining sheets of metal is also applicable in the construction of boilers and tubes, and to other purposes. It consists in:—

1st. Constructing suitable apparatus for commixing air with gases to be consumed in a furnace applicable to heating, brazing, soldering, welding, and smelting. For these purposes four kinds of apparatus, severally differing in their constructional arrangements are described, each having inlets for the admission of combustible gases, and other inlets either above or below for forcing in air, which is caused to commingle with the gases by any suitable mechanical means; thence the aerated gases are conducted through pipes or flexible tubes to the furnace which, when intense heat is required, is lined with bricks or clay mixed with mica or asbestos, the clay being combined with oxide of iron or silica.

2nd. Relates to the different fluxes employed, and which consist of two, three, or four of the following substances variously proportioned and dissolved, and then dried, viz., borax, sal-ammoniac, salt-petre, bi-carbonate of potash, the carbonates of potash, soda, and lime, and the fluates and borates.

3rd. Relates to the various appliances employed in the mode of operating, and to the brazing material, which for iron or steel consists of from 50 to 75 parts of copper, and from 30 to 50 parts of zinc, or of copper and tin duly proportioned.

The metallic surfaces which are to be united, having been thoroughly cleaned and washed with the fluxing solution, have whilst in a heated state the brazing composition applied and liquified by the heat from gas flame intensified by a blow pipe, or by means of a fire in a travelling furnace excited by a pair of bellows. The marginal surfaces of the plates, which are lapped together in the

construction of steam boilers, are merely in the first instance held in position by a few wire rivets, and subsequently united by the brazing composition which is applied and caused to flow in between the meeting surfaces, so as to form a solid lap or joint.

Large and small tubes, suitable for cannon, steam boilers, hydraulic and other presses, have not only the overlap increased, but receive additional thickness by coiling thin metal (previously dipped in the fluxing solution and dried) round and round them until the desired "thickness of metal is attained, and then applying the brazing or soldering material to the end and fluxing it, the whole tube being simultaneously heated so as to cause the fused metal to flow into the interior; should the tube be very long, each end in succession may be brazed by burying part of the cylinder in an upright position in the earth while the other end is subjected to the heating process."

"Immensely strong tubes suitable for canon may be constructed by having ribands of steel or rolled iron or other metal previously electro-plated or otherwise well cleaned and dipped in the fluxion solution and dried, folded over, and prepared, smooth bored or rifled cylinder, and each fold or several folds may be brazed or soldered together accordingly as is considered desirable. The rifling may also be made by brazing strips of steel to the cylinder, thus strengthening instead of weakening the gun. The ribands above-mentioned may be coiled fold over fold, either so as to break joint or to cross and interlace each other."

[Printed, 6d. No Drawings.]

A.D. 1863, November 7.—N° 2779.

HASELTINE, GEORGE.—(*A communication from Elijah Valentine and Moses Thompson Ridout.*)—This is the invention of a machine designed for bending metallic pipes or spouts. The machine operates by means of a swaging wheel or disc roller which is concave on its periphery, and has lapped partly round it a flexible band of india-rubber or other suitable material. This band at one end is attached to an upright steel spring, and passing round the swaging roller, the other end is fixed to a hook situated immediately behind the wheel. The movements

of the wheel, which is actuated by a radial projecting lever, are directed by an arc-formed guide and guiding block, over the curved surface of a shaping block, in contact with a round flexible mandril, which is composed of laminated steel bands fixed on each side of an india-rubber foundation, and projecting between the swaging roller and the block, yield when the roller is brought down by the lever and guide. The upper surface of the shaping block is made concave to correspond with the surface of of the roller, and it is covered with india-rubber or other elastic material, so that no hard rigid substance either externally or internally, is brought into contact with the surface of the spout or pipe, which during the process of bending, is placed upon the mandril and held secure in position upon the block by means of a treadle, whilst the actuating lever is depressed and the pressure of the roller thereby brought to bear upon the tube, which by means of the direction given to the roller by the arc-formed guides is forced to take the curved form of the block. When the bending operation is finished, the flexible mandril is drawn from the tube by the action of a lever horizontally disposed at the opposite side of the machine.

[Printed, &c. Drawing.]

A.D. 1863, November 16.—N<sup>o</sup> 2865.

CAMERON, SAMUEL, and JOHNSTON, WILLIAM. — This invention relates to the construction of taps, to valvular apparatus adapted to waterclosets, and to swivel jointing or connecting the pipes employed for such and other purposes.

The main feature in the construction of taps, valvular apparatus, &c., consists in making the barrels of taps and chambers of valvular apparatus in two halves or parts, which are fitted and screwed together (like the two parts of a bearing for a shaft) before they are bored. Several modifications of these taps are shewn and described, the plugs being designed and fitted to discharge and shut off in various ways.

Three modifications of fittings of waterclosets are contrived on the same principle, but differing in the details of construction, and the mode of filling and discharging.

Pipe sockets designed for swivel joints are constructed and fitted like the barrels of taps in two halves or parts; these swivel

joints are adapted to the swivel joints of gas brackets and to other purposes where (as also in the case of taps) the capability of ready adjustment after wear is desirable.

[Printed, 10d. Drawing.]

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1864.

A.D. 1864, January 14.—N<sup>o</sup> 108.

**THOMPSON, JAMES.** — (*Provisional protection only.*) — This invention relating to the manufacture of tubes, and barrels for fire-arms and ordnance made solid without weld, is supplementary to prior Letters Patent granted to this inventor, and bearing date April 24, 1863. No. 1023, whereby are produced, by the employment of a steam hammer fitted with the requisite appliances, hollow masses or billets of steel or other metal, punched through the center or axis, and afterwards rolled into tubes or barrels with solid breeches, the rolls being suitably formed for the purpose. According to the present invention the hollow or tubular billet intended to form a gun barrel is, when punched, removed upon a mandril to a tilt or forge hammer, under the action of which it is drawn out and an enlargement formed at the end. It is then operated upon by an hydraulic press, which is fitted with a die and a punch on the plunger, that enlarges and regulates the hole or bore, and equalizes the metal by being introduced at the opposite end to that at which the billet was pierced by the original punch of the steam hammer.

The invention also refers to a method of operating upon and shaping the lump or enlargement formed on the breech end of the barrel by means of a stamp and die, which give to that portion of the barrel the requisite form. The barrel is passed through the die, and resting upon the shoulder of the enlarged breech, is in that position operated upon by the stamp, and thereby the enlargement is reduced to the desired shape and size, a plug being inserted in the breech end to support and maintain its form whilst the metal in a heated state is undergoing the operation.

[Printed, 4d. No Drawings.]



A.D. 1864, January 19.—N° 139.

THOMPSON, JAMES.—This invention, relating to the manufacture of seamless tubes for gun barrels and other purposes, consists in the preparation of what are termed the "moulds" or ingots, which are made direct from the bloom, and so punched to make them tubular that the metal displaced by the punching operation is distributed laterally and not driven out in the form of a pellet. The punch tapers towards the end, which terminates with a blunt point, and the operation is effected by steam power with an apparatus similar in construction to a steam hammer, which operates by a succession of three or four blows, the ingot being held fixed on an anvil block by a suitable screw cramp. When punching moulds for the barrels of muzzle-loading fire-arms, the punch is not driven entirely through, so that the end intended to form the breech is left solid. After the punching operation, the mould is placed upon a mandril and hammered or swaged, and finally it is passed between grooved rollers, which cause its longitudinal extension, and reduce it to the desired transverse size.

The grooves in the rollers, instead of being uniform in size, gradually increase in depth and breadth round the rollers, and terminate in an enlargement, which produces the lump of additional metal required at the breech end of the barrel.

The specification of a prior patent granted to this inventor April 24th, 1863, No. 1023, is referred to.

[Printed, *Is.* Drawing.]

A.D. 1864, January 23.—N° 190.

STEWART, DAVID YOCLOW.—This invention relates to the appliances employed in forming the moulds for casting pipes, tubes, columns and similar articles, and to a mode of supporting and steadying the cores employed. The invention is applicable in cases where the pattern is shifted as the mould is formed, and consists in the use of a crosshead, through which the spindle of the pattern passes and is free to rotate, the ends of the crosshead fitting into grooves or guides formed along the top edges of the sides of the mould box, and by this means the pattern is caused to move along both steadily and true.

The mode adopted for supporting the cores, is more particularly applicable to cores of smaller diameter, to which whilst in the

mould, longitudinal tension is applied, so as to stretch and stiffen them, and thereby prevent deflection, supporting chaplets or thickness pegs not being required. This stiffening of the cores is effected by means of screws, wedges, or other equivalent appliances either in strong frames, or upon the moulding boxes, the tension being maintained until the casting is finished.

[Printed, 10*d*. Drawing.]

A.D. 1864, February 6.—N<sup>o</sup> 320.

SINIBALDI, MARIE CELESTE de CASTERAS.—This invention relates to the manufacture of tubes, cylinders, compound plates and other articles, consisting of laminated plates, coated and united with other metals.

The compound plates are made by laminating iron or steel plates with an intermediate plate of copper, brass, or other suitable metal, and immersing them in a bath of the same metal in a molten state, all the sheets previous to the operation having their surfaces made thoroughly clean, are washed over or immersed in a solution of borax or other flux.

Another method consists in first coating the sheets of iron or steel which are to be united, with the same metal in which when placed together they are to be immersed, or in a bath of metal that will liquify at a lower temperature.

Describes the mode of making and working compound plates by these methods, of sufficient length to reach round or extend from end to end of a ship or other structure.

Tubes or cylinders are formed by taking a plate of iron or steel that is coated with other metal, and rolling it so tightly upon a mandril, that each successive lap is brought into intimate contact with the preceding, until sufficient thickness is obtained; in this position after being secured by screws to prevent its uncoiling, it is either immersed in molten copper or brass, or subjected in a box lined with fire-clay or loam, to the required high temperature in a suitable furnace. By this means the coating is melted, and the several laps are brazed together.

"I also construct plates by weaving together bars or rods of  
"iron or steel to form a kind of wickerwork, and then unite them  
"by immersion in molten copper or other metals. Or I coil  
"together a number of links of hoop iron, and form thereof a  
"coat of mail, and cover it with brass or other metals in a molten

"state. For coating the surfaces of cylinders or tubes with copper, brass or other like metals, I first clean thoroughly the surface to be covered and fix thereto a lining or covering formed of a sheet or number of sheets, or a tube of copper or other metal, also having its surface thoroughly cleaned, and secure them firmly together, and after immersing them in borax or other flux, unite them by the application of heat."

Iron or steel plates for ornamental purposes, are made by first cutting or stamping the design on or through the plates, and after preparing and placing them in a box or mould, causing the molten brass or other metal to flow over them. By this means the interstices in the iron or steel plates are filled with the brass, which adheres thereto, and in this state it is allowed to cool. When taken out of the moulds the plate is reduced to a smooth even surface, and polished until the ornamental design is perfectly defined.

[Printed, 2s. 4d. Drawings.]

A.D. 1864, February 10.—No 354.

HAWTHORN, WILLIAM.—This invention relates to an apparatus designed for closing the ends of pipes, tubes, and hollow vessels, during the operation of testing them under high pressure, whether of steam, air, gas, or liquid.

The apparatus has mounted within it, two caps carried by cross-heads, the ends of which are supported by two horizontal bolts or guides. The caps face each other at a certain distance apart corresponding to the length of the pipe, and into them the two ends of the pipe are inserted, one into each cap. One of the crossheads is fixed at one end of the apparatus, and the other has liberty to slide along the bolt guides when actuated by a screw. The recess in each cap has two diameters, respectively corresponding, one to the external and the other to the internal diameter of the pipe, the ends of which when inserted in the caps abut when screwed up and form flush joints against the annular shoulders formed in the caps at the point where the large diameter suddenly ends. Inside the pipe one at each end, disposed so as to be partly within the ends of the pipe, and partly within the small diameter of the caps, are two short tubes or flat collars of india-rubber, which cover the joint, and when the pressure is applied, are pressed into intimate contact with the metallic surfaces, so as to permit no escape of the steam or fluid, which is introduced and



afterwards passes out through suitable openings in the caps, governed by stop-cocks respectively in communication, one with the force pump, and the other with the atmosphere.

[Printed, *8d.* Drawing.]

A.D. 1864, March 3.—N° 541.

**HARDING, GUSTAVUS PALMER.**—This invention, relating to the manufacture of tubes, rods, bars and plates, consists for the purpose, in the employment of an expanding die or draw-plate, by means of which, tubes conical, cylindrical, polygonal, or of other form, externally may be made to vary in size without changing the draw-plates; also the same effect may be produced on bars, rods, and plates, the expanding dies or plates being suitably fashioned to impart to them the required form. The machinery adapted to the drawing of "tapering gun barrels, is composed of a cast-iron box, in which I insert a number of loose pieces of metal with slots to receive a similar number of draw plates. These loose pieces of metal are supported by shoulders left in the cast-iron box. Screw pins act on the back of the draw plates. These pins are worked by bevelled wheels gearing into each other outside the box. One of these wheels carries a pinion driven by some prime mover. The tube is drawn over a mandril and through the draw plates fixed, say, at 1 inch diameter, but as the drawing proceeds the draw plates are moved by the action of the driving pinion on the bevelled wheels and screws, and if the original reduction of the tube by the draw plates be  $\frac{1}{4}$  inch it can be lessened gradually to nothing in any desired lengths, so that by repeating the draw and reduction, conical tubes with a cylindrical bore would be obtained perfectly true throughout."

Tubes may be made parallel or tapering at intervals throughout any portion of their length, and during the operation they are supported on mandrils of the requisite size; when making conical tubes it is preferred to draw from the smaller to the larger end. Tapering gun barrels may be made in double lengths by causing the dies respectively to recede gradually up to the midlength of the tube, and then by a reverse movement gradually approach each other. By this means a tube is produced gradually tapering from the mid-length towards the two ends, and by dividing such a tube two gun barrels are produced.



Irregular conical tubes or bars are formed from parallel tubes or bars, by drawing them a short distance or portion of their length only through each of a series of draw plates, severally graduating in the size of their respective dies: this is called drawing by stages, during which process when operating upon tubes, supporting mandrils should be employed.

[Printed, 10d. Drawing.]

A.D. 1864, March 23.—N<sup>o</sup> 736.

HEAD, THOMAS HOWARD, and SMITH, HENRY.—This invention relates to the method and apparatus employed for moulding pipes, and also other articles of cast metal.

"In moulding pipes, the box in which the mould is made is fixed to a horizontal bed plate mounted on a frame. The pattern is fixed in the centre of the horizontal bed plate on axes which are supported in bearings; a toothed wheel is fixed to one of the axes, and is geared into by a pinion moved by a crank handle or wheel. The moulding box is then put on the horizontal bed plate, and the ramming performed in the ordinary way; when rammed the pattern is revolved or turned half round through the toothed wheel and pinion, or other suitable gear, till it comes to the clearance on each side of the pattern, which will leave the mould clear. By this means the mould is finished before it is taken off the horizontal bed plate. The box is then taken off and the pattern turned back to its place. The other part of the box is then proceeded with in the same way as the first. This apparatus is fixed on wheels, so that it can be moved along a pipe bank, or it can be made a fixture."

The constructional arrangements of the apparatus employed for moulding other articles are considerably modified.

[Printed, 1s. 4d. Drawings.]

A.D. 1864, March 26.—N<sup>o</sup> 758.

RAMMELL, THOMAS WEBSTER.—This invention relates to the constructional arrangements of passenger and other lines of pneumatic railways, to the various apparatus employed, and to the rolling stock and mode of working; it also relates to the construction of the pneumatic tubes. The first part of the invention will be found described in the volume of Abridgments entitled "Railways."

The metallic tubes employed on pneumatic passenger and other lines of railway worked on the same principle of propulsion are, by reason of their large diameter, cast in three or more longitudinal segmental sections of equal length, forming when fitted together part of a perfect tube through which the trains of carriages pass. Each "segment may however, for convenience, be cast in one or "more parts, which in that case should be bolted together to form "a full-sized plate before the work of laying is commenced. I "form the base of the tube of one segmental plate (which may be "subdivided as described), having internal ribs and a smooth "external surface to take an even bed upon the concrete or other "foundation employed, and the upper portion of either of two segmental plates, springing from the base and meeting at the crown, "or of three segmental plates, two springing from the base and "meeting the third or upper plate at the haunches, and these I "cast with external ribs and a smooth internal surface, offering "but little resistance to the pneumatic current. I unite the segmental plates together longitudinally with bolts and flanges, "forming recesses along the lower joints, in order that the bolts "there may be inserted from the inside. The complete sectional "lengths I unite with a lap or socket joint, so constructed that in "the process of laying the tube the several sections may be set at "any desired angle, one with another, and any required curve, "either vertical or horizontal, be thus formed, and also that the "cement or other material employed for making the joint and "the necessary bolts may be inserted from the inside. I prefer "to lay these tubes upon a bed of concrete, which I first form to "an even surface corresponding with the outer contour of the "base plate, and I fill in the trench immediately around the "upper plates with the same material, which thus becomes part "of the structure, adding to the strength of the tube, and "allowing of a saving in the thickness of the plates."

Double tubes or tube ways are adapted to mines, one section serving for the traffic, and the other for the return current, without interfering with the ventilation of the mine.

[Printed, 1s. 6d. Drawings.]

A.D. 1864, April 12.—N° 909.

MENNONS, MARC ANTOINE FRANÇOIS.—(*A communication from Eugène Joseph Lacroix.*)—(*Provisional protection only.*)—This invention relates to apparatus adapted to the drawing or

rolling of metallic tubes by means of an hydraulic press and revolving dies. This apparatus which is capable of operating upon four gun barrels simultaneously, consists of a central vertical cylinder and plunger, which carries on its upper end a strong rectangular plate, to the four sides of which the actuating details of the apparatus depend; these details consist of four sockets (one on each side) in which are fixed respectively four pendent screws, upon the lower ends of which the upper ends of the four tubes or gun barrels are screwed, and depend therefrom in the direction of the vertical plane of the dies. These dies act in pairs, one pair at each side of the apparatus, each pair consisting of two disc roller dies, which revolve on axes, the periphery of both being grooved eccentrically, in order that the necessary tapering form may be imparted to the tubes. On the axis of each roller die there is a tooth pinion, which engages with the teeth of intermediate rack bars, that depend from the rectangular plate to which they are affixed; these racks maintain the relative position of the dies, so that at the meeting point of their respective peripheries on the plane of their axes, the varying depth of the groove in each roller is always uniform. Four mandril rods project upwards from the base of the machine and carry mandrils, which enter, one into each tube, and terminate just above the plane of the meeting point of the dies. When the plunger is set in motion, it rises and draws the four tubes upwards, dragging them between the dies, which are thus caused to rotate on their axes; the speed of this movement of the dies is not allowed to be coincident with the rise of the plunger, as the rotation of the dies is regulated by the racks and the size of the pinions. After the operation the plunger gravitates by its own weight, and by means of the racks and pinions, the dies of each pair are turned back to their relative normal position.

[Printed, 8d. Drawings.]

A.D. 1864, April 12.—N<sup>o</sup> 923.

NEWTON, WILLIAM EDWARD.—(*A communication from Henry Watelet, Charles Watelet, and Edmund de Lacotte.*)—(*Provisional protection only.*)—This invention consists of various modes of connecting metallic pipes in such manner, that expansion and contraction of the pipes may take place without injury to the joint; it also relates to the construction of stop-cocks or valves.



In connecting flanged pipes, a packing ring or washer of india-rubber or other yielding substance is interposed between the meeting surfaces, which are then drawn together by bolts with nuts or cottars, adapted to the flanges or to lugs cast thereon.

Instead of placing an india-rubber packing between the meeting surfaces at the adjoining ends of pipes, a short cylinder of india-rubber may be made to envelope the joint, and be pressed into intimate contact therewith by a metal collar tightened round it by screwing or otherwise; this arrangement is available when pipes are laid relatively deviating from a direct line, and in the case of gas pipes, a ring of lead may be first adjusted over the crevice of the joint and covered with a short cylinder of india-rubber, and exterior to that a metallic conical ring may be tightened on by clamps. "By casting on the pipes, shoulders with inclined faces, and notches made therein to allow the clamps to pass, the pipes may be held together securely without the use of screws, wedges, or cottars, by simply driving the clamps forward along the inclined faces of the shoulders."

In some cases annular V-grooves are formed in the meeting surface of pipes to receive a ring of soft metal, which when the pipes are drawn together, is compressed between them, and forms an air-tight joint. The plain ends and the sockets of pipes may be screw-threaded, and a ring or collar of soft metal be driven or forced between them; and another modification consists in screw-threading the ends of pipes externally, and compressing thereon by means of screw clamps or other contrivance, a soft metal collar.

Stop cocks or valves are made wedge-shaped and fitted with screwed shafts or spindles; those of large size have two spindles geared together.

[Printed, 4d. No Drawings.]

A.D. 1864, April 22.—N<sup>o</sup> 1018.

THOMPSON, JAMES.—This invention relating to the manufacture of seamless tubes of iron, steel or other metals, is supplementary to prior inventions, for which were granted Letters Patent, dated April 24, 1863, and numbered respectively 1023, and 1024; to an application made January 14, No. 108, and to a subsequent Patent dated January 19, No. 139, in the present year. The present invention consists in operating upon blooms or lumps of



iron, steel, copper or other metal or alloys which, by heating, swaging, hammering, rolling, pressing, or otherwise, have thereby been formed or converted from the original to preliminary shapes, adapted to the purposes for which they may be subsequently required. Masses so prepared are, in a heated condition placed under the operation of a punch or plunger, fitted in a press or apparatus and actuated by any suitable mechanical force or motive power. This punching process has the effect of condensing the substance of the metal, by forcing or displacing the central portion, which is pierced by the punch and compressibly forced into the surrounding part, the metal piece or mass during the operation being externally supported between the adjustable or advancing jaws of the press or apparatus, as the metal is carried forward and brought concentrically beneath the punch. After this combined punching and compressing process, the hollow or tubular masses are by forging, rolling, drawing, or other suitable means, manufactured into seamless tubes of uniform strength, and into cylinders, axles, calico printing rollers, and other similar articles.

[Printed, 4d. No Drawings.]

A.D. 1864, July 13.—N° 1751.

SMITH, BENJAMIN.—This invention relates to the manufacture of metallic tubes, and to the dies, rings, and instruments through which during the process such tubes are drawn. These dies, rings, or instruments are “made by what is technically called chill casting, and such dies, rings, or instruments when in use are placed in suitable draw plates or other holders. The forms of these rings or instruments will be varied according to the circumstances under which they are to be used. In making chill cast rings, dies or instruments for finishing iron and steel tubes where the edges of the dies, rings, or instruments are to produce a slight cutting effect, the dies, rings, or instruments are made truly cylindrical or parallel on the inside. The ends are by preference formed at right angles to the central axis of the instrument. On the outside a projecting or surrounding rib or projecting collar is formed, on which in some cases a hoop of wrought iron is shrunk; this collar or projecting rib is to enter a groove or recess formed in the draw plate or other suitable holder; by this means what may be called a chill cast-iron bushing or lining will be used in the passage of the draw plate or holder, through

“ which a tube is drawn, which lining or bushing may be readily  
“ changed or turned end for end when one end has been worn;  
“ or the worn end may be ground off, and the instrument again  
“ used. When the rings, dies or instruments are to be otherwise  
“ employed, then the forms will be modified accordingly.”

“ In casting these instruments, iron moulds are used with  
“ internal iron mandrils or cores of the form and sizes of the  
“ desired interior passages of the instruments, which cores or  
“ mandrils are driven out as quickly as may be, in order that the  
“ cast metal may not cool too much thereon, as is well understood  
“ in making chill castings for other purposes.”

[Printed, 8d. Drawing.]

A.D. 1864, August 5.—N° 1954.

HENRY, MICHAEL. — (*A communication from Victor Henry Sophie Frederic Gueldry.*)—(*Provisional protection only.*)—This invention, relating to the manufacture of metallic pipes, tubes, and cylinders, is chiefly applicable to the drawing of cast cylinders, seamless tubes, and other articles of copper or its alloys taken in the rough state and drawn whilst cold. Instead of applying the tractive power to the mandril, it is, according to this invention, applied to the tube, cylinder, or article which is to be drawn or shaped by dragging it through a hole or holes in a draw plate, such holes or dies being transversely smaller than the tube itself. This according to one method is effected “by placing two blocks on the mandril, one at or near one end of the tube or article to be drawn, a ring or collar being interposed between them, and the other is behind the die or drawplate; power may be applied to one or other of these blocks to force or draw the metal through the die, drawplate, or hole.”

The die or hole in the drawplate is elongated, and so formed “that every portion of the outer surface of the tube or other article is subjected to a protracted pressing action, the said tube or article as it passes along being pressed, forced, or brought into contact with the pressing or squeezing surface for sufficient time to reduce or remove the elasticity of the metal or tendency thereof to crack.”

[Printed, 4d. No Drawings.]

A.D. 1864, August 30.—N° 2126.

LONES, JOHN.—This invention relates to the process of coating and lining iron with steel, applicable to bars and tubes.

The steel covering or shell for a bar or tube is prepared in two longitudinal halves or parts, rolled to inclose the bar or tube, and fit to its external shape, one on each side. If the form of the bar or tube is cylindrical, the coating plates have transversely a semicircular form, and if polygonal or otherwise, the coating plates internally are formed to correspond. When placed together, the bar or tube being inclosed by the two half covers, they are introduced within a furnace or otherwise, and when heated to a welding temperature they are taken out and passed between a suitably formed pair of rolls, and by this means the metals are welded together. Instead of employing rollers for the purpose, the welding may be effected by a forging process. When iron tubes are lined with steel as well as coated externally, the steel lining is introduced into the iron tube in a tubular or semi-tubular form at the same time that the coating shells are applied, previous to the heating process, and a mandril is inserted within the steel lining tube to support and maintain its tubular form whilst passing through the rolls.

[Printed, 8d. Drawing.]

A.D. 1864, September 2.—N° 2161.

BROOMAN, RICHARD ARCHIBALD.—(*A communication from Hypolyte Brocard and Edward Hunniball.*)—This invention relates to the construction and use of soft metal washers, adapted to the meeting surfaces of pipes and articles when jointing or connecting them together, for the purpose of making such joints or connections fluid tight. These washers or packings of lead are “shaped in rolls or otherwise with longitudinal grooves, and “placed between the surfaces to be joined. These washers being “subjected to pressure, the lead yields and impresses itself with “the surfaces united by the compression of the tightening agents “used, so as to follow exactly the more or less irregular con- “formation of the said surfaces. A joint perfectly hermetic is “thus constituted without the use of white lead and yarn.”

“For some purposes the lead washer is formed from a strip of “lead, the cross section of which is that of a lozenge, and again



“ for some purposes the washer is in the form of wire. The edges of the washer should be scarfed, in order that they may fit together when bent into a circular or oval form.”

“ In the formation of the lead washers by moulding they may be made either straight or sinuous, or of circular or oval form. Instead of the continuous rectangular edges of the grooves, the edges of the washers may be formed with notches or otherwise, according to the purpose to which they are to be applied.”

[Printed, 8d. Drawing.]

A.D. 1864, September 13.—N<sup>o</sup> 2238.

TAYLOR, SAMUEL JOHN.—(*Provisional protection only.*)—This invention, relating to the manufacture of articles of hollow iron ware, such as saucepans, pots, and basins, is also applicable to the construction of tubes and pipes. It chiefly refers to such articles of cast iron as receive a coating or lining of tin, glass, or enamel, for which purpose ordinarily their interiors are made clean and smooth by turning them in a lathe, the subsequent tinning or coating being a tedious operation. The invention is described with reference to the manufacture of a basin, and consists in making the internal surfaces of such or other hollow articles which are to be subsequently lined or coated, of thin wrought iron. It is described as follows:—“ I form from sheet iron, by stamping or otherwise, a thin basin of the shape and size of the interior of the basin to be made. This thin basin I employ as a lining to the cast iron, of which the greater part of the basin is made. I cast the cast-iron part of the basin in the ordinary way, excepting that I place the said sheet iron basin or lining in the mould in which the cast-iron basin is to be cast, and I cast the cast-iron basin upon the sheet-iron basin in the mould. There is thus produced a cast-iron basin having a lining of wrought iron, the said lining being inseparably attached to the cast iron. The wrought-iron lining of the basin may be tinned without being turned in a lathe, as it only requires cleaning with dilute sulphuric acid or other acid employed for cleaning iron, when it will readily take the coating of tin. The basin made in the manner described also receives a coating of enamel more readily than if the surface to be enamelled were made of cast iron.”



Compound metallic pipes and other articles not requiring to be coated or lined internally with tin, glass, or enamel, may also be made by this invention.

[Printed, 47. No Drawings.]

A.D. 1864, September 22.—N<sup>o</sup> 2333.

BARR, PETER.—This invention relates to the construction of apparatus designed for forming the moulds for casting "pipes of various sizes and forms in the same machine without the use of skilled labor." The apparatus consists of two profile plates horizontally mounted upon one central and two end standards relatively kept in position by long tie bolts. The upper surfaces of the plates are level one with the other, and their contiguous edges are shaped to form between them an opening exactly corresponding in size and form with the diameter of the pipe pattern, which fills the opening when laid therein upon eccentrics, by the turning of which after the mould is made the pattern is lowered. The plates form the parting surfaces of the mould, which is made in two half parts, each in separate moulding boxes which, when afterwards placed together, form the perfect mould. The pattern being placed in the opening, is raised until exactly one longitudinal half of it is projected above the plane surface of the plates. The box in which the lower half of the mould is to be formed, is then placed on the plates in a proper position over the pattern, and the sand is rammed into it in the usual way; when completely filled, the pattern is lowered by means of the eccentrics, and the box being lifted off, is turned over and placed in position to receive the core; the upper box is then placed over the pattern which is again raised, and the sand being rammed in the pattern is again lowered and the box lifted off and placed face downwards in position upon the other box, and thus the complete mould is formed. Pipes differing in shape require profile plates of corresponding configuration.

[Printed, 10d. Drawing.]

A.D. 1864, September 24.—N<sup>o</sup> 2343.

TODD, JOHN.—This invention (as stated by the inventor) "has for its object the rolling, bending, and circling of plates and sheets of iron and other metals, either of uniform thickness throughout or with thicker and thinner edges, into segments

“ or complete circles, or even to overlap sufficiently for being  
“ soldered, welded, or rivetted into tubes, pipes, circular boilers,  
“ boiler flues, funnels, steel or iron masts, yards, or other similar  
“ articles, by using top rolls of different diameters and either  
“ parallel or tapered; and I accomplish this object by supplying  
“ greater facilities in working and regulating the top pressing  
“ rolls of the said machines and machinery by the application of  
“ additional gearing with pulleys and strap, whereby the top roll  
“ by means of the top shaft is elevated or depressed at either end  
“ separately or at both ends simultaneously as required by steam  
“ power within or by the machine itself, or by using hand wheels  
“ on the top shaft the same operation may be performed when  
“ that is more convenient than by using the pulleys and strap.  
“ The said top rolls may be made of cast or wrought iron or  
“ steel of different diameters and parallel or tapered as required.  
“ By the application of moveable antifricition bearings fitted into  
“ the principal sliding bolsters which suspend and carry the top  
“ pressing roll, wrought-iron shafts can be fixed into the said top  
“ rolls (when made of cast iron), and in either case have journals  
“ to revolve in brass bushes fixed in the antifricition bearings, the  
“ latter being made larger in diameter than the top pressing roll,  
“ which will allow the top roll to be withdrawn at either end of  
“ the machine through the principal sliding bolsters, and through  
“ a suitable opening or apertures in either of the two spur  
“ wheels (one at each end of the machine) which drive the bottom  
“ rolls when driving spur wheels of the diameter shewn in the  
“ Drawings are used. The top roll and antifricition bearings are  
“ kept in their places by a lever at each end of the said roll, and  
“ by raising either of the two levers the antifricition bearing or  
“ the top roll can be withdrawn at that end of the machine at  
“ which the lever is raised.”

[Printed, 10d. Drawing.]

A.D. 1864, September 26.—N<sup>o</sup> 2357.

SCOTT, WILLIAM.—This invention of apparatus adapted to the casting of iron pipes consists of a cast or malleable iron mould combined with a hollow collapsible core bar of the same metal.

The inside of the mould has the desired form of the outside of the pipes intended to be cast therein, and the outer metallic shell of the core is slit from end to end, and corresponds with their

internal diameter or bore. The diameter of the core bar may be increased at pleasure by a central rod, which at intervals in its length is furnished with left and right handed screw threads and nuts that cause by means of sets of levers jointed to the nuts when the bar is turned in one or other direction, the distension and contraction of the shell, the slit in which when forced open is filled up by a longitudinal strip or wedge that is drawn into the shell by the action of the levers when the bar is collapsed.

The faucet core is caused to collapse in the same manner as the pipe core, and the expansion of the latter is limited by means of a flanged plate that covers the top of the bar. The surfaces of the mould and cores against which the molten metal flows, may receive a coating of either tar, resin, ordinary black wash or blacking, or a mixture of coal tar and sand, and by this means pipes may be cast without the use of sand moulds. According to the drawing, the moulds, faucet end downwards, are mounted vertically on a carriage travelling on wheels.

[Printed, 8d. Drawing.]

A.D. 1864, September 26.—N° 2360.

HARRISON, JOHN ATKINSON.—(*Provisional protection only.*)  
—This invention relates to a process of manufacturing or moulding into pipes and various other forms, the slag or scoria which runs from the blast and other furnaces employed in smelting metallic ores. The slag is received from the furnace in a fluid state, and run into moulds of ordinary or other construction, either with or without pressure, and alone or mixed with other fluid, gas, vapour, or substance, subsequent cracking or fracturing of the pipes and other articles being prevented before cooling by a process of annealing, in effect the same as the process employed in the manufacture of glass. Ovens or covered ways of convenient size are constructed either above or below the surface of the ground to receive the moulded articles, where they are kept in a heated state until the annealing of them is complete when they may be allowed to cool with safety, arrangements being made for regulating the temperature of the ovens as required; the articles during the process are either kept therein in a stationary position or moved about by any suitable mechanical or other contrivance.

[Printed, 4d. No Drawings.]

M.P.

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A.D. 1864, October 13.—N° 2520.

MENNONS, MARC ANTOINE FRANÇOIS.—(*A communication from Eugène Joseph Lacroix.*)—(*Provisional protection only.*)—This invention relates to a mode of applying hydraulic or other pressure, as the means of actuating machinery designed for drawing and rolling metals. The machine described is constructed to draw four gun barrels simultaneously between four pairs of disc rollers, which for the purpose also of tapering the barrels, are severally eccentrically grooved on the periphery, and the two rollers of each pair, act independently on separate pieces of metal as revolving dies, the eccentricity of the grooves causing as they respectively revolve, a gradual change in the size of the opening or hole formed between them on the plane of their axes, at the point where their peripheries meet. The hydraulic cylinder is disposed vertically in the center of the apparatus, and the plunger carries at its upper end a rectangular plate, in the four sides of which are formed sockets to receive the screws which drag up the tubes between the roller dies, a pair of the latter being disposed at each side directly beneath the sockets. The axis of each roller die carries a tooth pinion, and the pinions of each pair of dies gear into a toothed rack which depends from the rectangular plate, one rack to each pair of dies, and by these racks the speed of the dies is regulated and made uniform when set in motion by the rising of the plunger, which drags up the four tubes or barrels simultaneously, the friction and pressure causing the dies to rotate. The lower ends of the rods which carry the mandrils are fixed to the foundation, one in a direct vertical line beneath each pair of dies. The plunger, which is raised by the pressure, descends by its own weight, bringing down the racks which, by means of the pinions, return the pairs of dies to their normal position.

[Printed, 8d. Drawing.]

A.D. 1864, November 9.—N° 2784.

THOMPSON, JAMES.—This invention consists in the application or use of "Bessemer's steel" in the manufacture of gun barrels and ordnance. This metal, in quantity sufficient to make one or more of the articles required, is taken from the bloom in a heated state, and by hammering, swaging, rolling, or otherwise, it is worked into the required form, such hammering, etc. being



also essential to produce the effect of solidifying and improving the condition of the metal. The piece of metal, after the preliminary hammering and shaping process, is perforated by a punch, either after the manner described in the Specifications of three prior patents, dated respectively April 24, 1863, Nos. 1023 and 1024, and January 19, 1864, No. 139, or by other equivalent means. The process is effected by steam or other motive power, and instead of the punch being fixed in the end of the piston rod of the apparatus, the said piston rod may have a hammer face, and be made to strike the punch whilst the latter is being held in the required concentric position by the hand or otherwise of the operator, a few blows sufficing to perforate a mass of metal large enough when subsequently divided to form one, two, or more barrels, external support if necessary during the punching process being applied.

After the punching operation, the Bessemer metal being reheated, is placed upon a mandril, passed through grooved rollers, and treated in the manner described in the specifications of the said former patents, and the said metal is thus worked into what are termed gun moulds, having formed on them during the process lumps or otherwise to supply the parts where extra solid metal is required.

[Printed, 4d. No Drawings.]

A.D. 1864, November 15.—N° 2845.

ROBINSON, GEORGE.—(*Provisional protection only.*)—This invention relates to the construction or formation of the moulds employed in the casting of pipes, columns, and other articles of iron, brass, and other metals.

The inventor says, "I construct moulds in two parts or halves, but instead of making both halves of the mould of sand according to the ordinary practise, I make the lower half of iron or of steel, and make the upper half of sand in the ordinary manner. The lower half of the mould, which is made of iron or steel I make by preference by casting, but the said lower half of the mould may be made by any of the processes by which iron and steel may be shaped. By making the lower half of the mould of iron or steel, the process of casting is much facilitated, especially where large numbers of articles are to be cast, as the inversion of the lower mould box necessary in the ordinary method of constructing moulds is avoided."

A.D. 1864, October 13.—N° 2520.

MENNONS, MARC ANTOINE FRANÇOIS.—(*A communication from Eugène Joseph Lacroix.*)—(*Provisional protection only.*)—This invention relates to a mode of applying hydraulic or other pressure, as the means of actuating machinery designed for drawing and rolling metals. The machine described is constructed to draw four gun barrels simultaneously between four pairs of disc rollers, which for the purpose also of tapering the barrels, are severally eccentrically grooved on the periphery, and the two rollers of each pair, act independently on separate pieces of metal as revolving dies, the eccentricity of the grooves causing as they respectively revolve, a gradual change in the size of the opening or hole formed between them on the plane of their axes, at the point where their peripheries meet. The hydraulic cylinder is disposed vertically in the center of the apparatus, and the plunger carries at its upper end a rectangular plate, in the four sides of which are formed sockets to receive the screws which drag up the tubes between the roller dies, a pair of the latter being disposed at each side directly beneath the sockets. The axis of each roller die carries a tooth pinion, and the pinions of each pair of dies gear into a toothed rack which depends from the rectangular plate, one rack to each pair of dies, and by these racks the speed of the dies is regulated and made uniform when set in motion by the rising of the plunger, which drags up the four tubes or barrels simultaneously, the friction and pressure causing the dies to rotate. The lower ends of the rods which carry the mandrils are fixed to the foundation, one in a direct vertical line beneath each pair of dies. The plunger, which is raised by the pressure, descends by its own weight, bringing down the racks which, by means of the pinions, return the pairs of dies to their normal position.

[Printed, *8d.* Drawing.]

A.D. 1864, November 9.—N° 2784.

THOMPSON, JAMES.—This invention consists in the application or use of "Bessemer's steel" in the manufacture of gun barrels and ordnance. This metal, in quantity sufficient to make one or more of the articles required, is taken from the bloom in a heated state, and by hammering, swaging, rolling, or otherwise, it is worked into the required form, such hammering, etc. being

also essential to produce the effect of solidifying and improving the condition of the metal. The piece of metal, after the preliminary hammering and shaping process, is perforated by a punch, either after the manner described in the Specifications of three prior patents, dated respectively April 24, 1863, Nos. 1023 and 1024, and January 19, 1864, No. 139, or by other equivalent means. The process is effected by steam or other motive power, and instead of the punch being fixed in the end of the piston rod of the apparatus, the said piston rod may have a hammer face, and be made to strike the punch whilst the latter is being held in the required concentric position by the hand or otherwise of the operator, a few blows sufficing to perforate a mass of metal large enough when subsequently divided to form one, two, or more barrels, external support if necessary during the punching process being applied.

After the punching operation, the Bessemer metal being reheated, is placed upon a mandril, passed through grooved rollers, and treated in the manner described in the specifications of the said former patents, and the said metal is thus worked into what are termed gun moulds, having formed on them during the process lumps or otherwise to supply the parts where extra solid metal is required.

[Printed, *Ad.* No Drawings.]

A.D. 1864, November 15.—N° 2845.

ROBINSON, GEORGE.—(*Provisional protection only.*)—This invention relates to the construction or formation of the moulds employed in the casting of pipes, columns, and other articles of iron, brass, and other metals.

The inventor says, "I construct moulds in two parts or halves, but instead of making both halves of the mould of sand according to the ordinary practise, I make the lower half of iron or of steel, and make the upper half of sand in the ordinary manner. The lower half of the mould, which is made of iron or steel I make by preference by casting, but the said lower half of the mould may be made by any of the processes by which iron and steel may be shaped. By making the lower half of the mould of iron or steel, the process of casting is much facilitated, especially where large numbers of articles are to be cast, as the inversion of the lower mould box necessary in the ordinary method of constructing moulds is avoided."



" In order to reduce still further the labour of lifting and in-  
 " verting the upper moulding box, the said upper moulding box  
 " may be hinged to the lower iron or steel half of the mould."

[Printed, 4d. No Drawings.]

A.D. 1864, November 18.—N° 2877.

FISHER, JAMES.—(*Provisional protection only.*)—This invention relates to the construction of the heating furnaces employed in the manufacture of welded iron tubes. These furnaces, instead of being provided with a fire-grate to each of the two compartments into which they are divided, have both compartments heated by one fire only, the warming compartment receiving secondarily the hot draught from the fire which heats the other or welding furnace. The inventor says:—

" I build the warming furnace and welding furnace side by  
 " side in the ordinary manner, but I build the warming furnace  
 " without any fire-grate. I build the welding furnace in the  
 " ordinary way, excepting that I close the end of the said fur-  
 " nace, instead of making it communicate directly with the stack.  
 " I perforate the wall separating the two furnaces with a series  
 " of holes, through which holes the flame and heated air from  
 " the welding furnace pass into the warming furnace, and from  
 " thence to the stack. By this arrangement the two furnaces are  
 " heated by the fire from one grate, namely, by the fire of the  
 " welding furnace grate. By constructing heating furnaces used  
 " in the manufacture of welded iron tubes according to my  
 " invention, great economy is effected in the fuel employed."

[Printed, 4d. No Drawings.]

A.D. 1864, December 14.—N° 3091.

BARNESLEY, JOSEPH.—(*Letters Patent void for want of Final Specification.*)—This invention relates to the construction of machinery adapted to the manufacture of seamless metal tubes, gun barrels, and artillery, from hollow blooms of iron, suited to the size of the tube, barrel, or article intended to be made therefrom. These blooms, taken separately from a heating furnace, are passed in succession through two or more pairs of grooved rollers arranged in a direct line, and at a greater distance apart from each other than the length of the barrel or tube. The rollers are caused to revolve at the required speed by tooth wheels, actuated by the



motive power. "A steel bar or rod runs through the whole train of rolls horizontally; it is secured at the further end to a back stand or support by a moveable screw, so that I can disengage the bar from the back stand. The bar has a shoulder worked in it behind the centre of each pair of rolls so as to support a mandrel, and behind the last pair of rolls the bar has a hinge joint, by which I disengage the tube, gun barrel, or cannon, when rolled, from the bar. Under the bar at a proper distance from each other, I place vertical self-adjusting moveable bars of iron, by which I support the horizontal bar, each of which vertical bars works on a shaft or pin, and is made heavier at the lower end so as to return to its vertical position; as the tube, gun barrel, or cannon passes beyond it along the horizontal bar, I place upon the horizontal bar in the centre of each pair of rolls an egg-shaped mandrel which I secure to the bar and against the shoulder by a cotter."

[Printed, 4d. No Drawings.]

A.D. 1864, December 26.—N° 3213.

WOLSTENHOLME, JOHN.—This invention relates to an apparatus designed for cutting or severing pipes transversely by means of a revolving steel disc cutter, the edge of which is forced into contact and caused to incise the pipe, by a screw. The axis of the cutter is carried by a small block fitted to slide in a clamp, the outer end of which is shaped to the form of a hook, to embrace and support the pipe when the cutter is operating. The screw passes through a threaded hole made in a strong piece which projects laterally from the base of the clamp, its extreme end abutting against the slide block, so that when the screw is turned the cutter is forced against the pipe; the other end of the screw being elongated forms the handle, whereby the apparatus when operating is moved round the pipe; by this means the cutter is caused to make an annular incision, and gradually to penetrate the metal of the pipe by the occasional setting up of the screw, the operation being continued until the pipe is cut

[Printed, 8d. Drawing.]

A.D. 1864, December 30.—N° 3251.

BROWN, WILLIAM HENRY.—This invention relates to the manufacture of cast steel and other metallic tubes, which by means of the apparatus employed are produced without seams

from tubular ingots by a rolling process, combined with a mandril of peculiar form. In producing such tubes suitable for gun barrels, cannon, and other purposes, two or more pairs of rollers are employed. The rolling apparatus described and illustrated has four pairs of rollers, disposed at regular distances, and in such manner that the circular holes formed by the grooves of each pair respectively, are relatively in a direct line with the others, the axes of each alternate pair being on a horizontal plane, and of the intermediate pairs vertical. The axis of the mandril lies in a direct line, passing between the pairs of rollers through the holes formed by their grooves, and at intervals in its length, corresponding to the distance apart of the several pairs of rolls, there is formed upon it a series of bulbous enlargements graduating in size, one enlargement coming exactly between each pair. The end of the cast tubular ingot is presented to the grooves of the first pair of rollers, and is drawn between them and forced by the friction upon and over the enlarged end of the mandril, the pressure reducing the diameter of the ingot and causing its elongation; thence it passes along the mandril to the next pair, which having smaller grooves continue to produce upon it the same reducing and lengthening effect, which effect is prolonged by the third pair, the fourth pair continuing and finishing the operation; thence the tube is slid on to the mandril shaft, and drawn off when the end of the mandril is released.

[Printed, 1s. Drawings.]

1865.

A.D. 1865, January 11.—N<sup>o</sup> 85.

GEDGE, WILLIAM EDWARD.—(*A communication from Jules Chartiez.*)—This invention relates to an apparatus designed for cutting transversely, gas and other iron pipes. The apparatus is a kind of hand stock with two handles, one projecting from each side for the purpose when cutting of turning or working it round. The pipe to be operated upon is passed through a central opening or frame, and the cutter which divides it, is deposited to slide in a groove, formed in a strong fixed stud which is screw-threaded externally. Projecting from the front side of the cutter are two

nebs, which admit the nut between them, and when the latter is turned in one or other direction, the sharp end of the cutter is caused to approach or recede from the pipe, which is supported on the opposite side during the cutting operation by a slide or bearing piece, made hollow on the face to suit the circularity of the pipe, against which it is projected by a screw. One part or end of the central frame of the stock is fitted to open by means of a joint for the purpose of admitting pipes which have projections or enlargements, that could not by reason of their size be passed through the stock. This apparatus is adjustable and capable of severing pipes of various sizes.

[Printed, 10d. Drawings.]

A.D. 1865, January 19.—N<sup>o</sup> 165.

SHIPTON, JAMES ALFRED, and MITCHELL, ROBERT.—This invention relates to apparatus adapted to forging and shaping the pieces of metal used for the manufacture of tees, elbows, bends, couplings for gas fittings, and metallic articles for other purposes.

The apparatus, which may be actuated by either motive power direct or by manual force, operates by pressure and percussion combined. The arrangement which is described and illustrated, is operated by the direct expansive power of steam, and consists of a pair of horizontal cylinders so disposed, that the ends of their piston rods carrying the operating dies, meet in a direct line from opposite directions, so that the dies strike and laterally press simultaneously upon the metallic article, which is deposited upon a moulding block midway between them, and held down by the vertical pressure of a third die or mandrel that is fixed in the lower end of the piston rod of a third cylinder, which is inverted and attached in vertical position to the frame work above, directly over the moulding block. The metal piece suitably shaped to form the article required, is laid upon the moulding block or die, and forced therein by a mandril, when the latter is pressed upon or struck by the die carried by the piston rod above; by this means the edges of the article are caused to turn up, and they are then operated upon at opposite sides by the simultaneous action of the pistons in the horizontal cylinders, the dies carried by the piston rods of which force the turned up sides of the article into contact with the mandril, and by repeated blows bring it to the desired form. The dies and mandrils are removable, so as when



necessary to give place to others suited in form to the production of the various articles required.

A second machine with two cylinders diagonally disposed and one vertically is also described. This machine is employed for forging, finishing, and planishing the articles which are placed on mandrils contained in sliding blocks moved by levers that are actuated by the vertical cylinder, the forging and finishing dies and planishing tools being fixed to the lower ends of the piston rods of the other cylinders, strike obliquely upon the work. The steam valves of both machines are regulated by hand levers. A variety of such dies and tools as are required to produce the various articles are exhibited on the drawing.

[Printed, 10d. Drawing.]

A.D. 1865, January 28.—N<sup>o</sup> 257.

FOSTER, WILLIAM.—This invention relates to screw taps or apparatus adapted to cutting internal screw threads on pipes and fittings, the parts being so constructed and arranged "that  
" the cutters may be withdrawn from their work without re-  
" versing or stopping the tap or machine in which said tap is  
" used. In the lower part of the stock are formed two or more  
" grooves converging downwards; in these grooves are placed  
" cutters which are kept from moving laterally by means of a  
" projection upon each side thereof passing into a recess formed  
" on the sides of the grooves, and they are connected at their  
" upper ends to a collar around the stock, and thus held in  
" position. This collar is loose on the stock, but is kept from  
" falling down by means of a pin passing through the stock and  
" projecting on both sides into a slot formed in the collar. These  
" slots extend each about one fourth around the collar, and are  
" so shaped that by turning said collar the cutters which are  
" attached thereto are raised or lowered as may be desired. When  
" the pins are at the lower part of the slot, the cutters are in  
" position for working. To keep the cutters in place when at  
" work, the lower part of the slot is made horizontal, the remainder  
" being inclined upward and forming with the lower part an  
" obtuse angle. When the cutters have completed their work,  
" the collar is held by means of handles fixed for convenience  
" on both sides thereof, and the spindle continuing to rotate  
" moves the pins along the said grooves, and consequently the  
" collar is lowered on the stock and forces the cutters down the



“ converging grooves ; by this means the cutters are set free  
“ from the thread of the screw and readily withdrawn by turning  
“ the collar until the pin is again brought to the lower part of  
“ the groove, when the cutters are in the proper position to form  
“ another thread.”

[Printed, 8d. Drawing.]

A.D. 1865, February 1.—N<sup>o</sup> 285.

PIERCE, GEORGE HENRY.—(*Provisional protection only.*)—This invention relates to the construction of the ends of socket and spigot pipes, and consists in forming one end of such “ pipes  
“ with a tapering socket to receive a spigot on the end of the  
“ next following pipe, which spigot is also tapered to fit into  
“ the tapered socket. I form the spigot with a flange round its  
“ base or largest circumference to prevent the lead or other  
“ material used for packing from being forced out by the pressure  
“ in the pipes. The base or smallest circumference of the socket  
“ is provided with a corresponding flange or shoulder in order  
“ that for heavy work, or where the joint is likely to get injured  
“ by the shaking of machinery or otherwise, a cramp iron may  
“ be placed on each side to clip or hold the flange on the spigot,  
“ and the flange or shoulder on the socket ; the cramp irons may  
“ be secured by a ring driven tightly over them.”

[Printed, 4d. No Drawings.]

A.D. 1865, February 8.—N<sup>o</sup> 356.

ANDERSON, WILLIAM.—(*Provisional protection only.*)—This invention relates to a mode of casting flanges to the ends of wrought metal pipes, instead of as heretofore fitting thereon wrought or cast iron flanges and securing them with rivets, which operation the inventor proposes to simplify by preparing  
“ a sand or other mould in which to cast a flange, and to set the  
“ wrought-iron pipe upon its end in the mould ; I then pour  
“ molten metal into the mould, which metal as it cools will  
“ shrink upon the pipe and hold firmly thereto. In order the  
“ better to ensure this union, I propose to tin or otherwise to  
“ coat the end of the pipe at the part which is to come in contact  
“ with the molten metal, so as to avoid presenting an oxidized  
“ metal surface to the molten metal.”

[Printed, 4d. No Drawings.]

A.D. 1865, February 11.—N° 390.

McLAREN, ANDREW.—(*Provisional protection only.*)—This invention relating to the construction of hot water apparatus adapted to the heating of churches and other places, refers to an addition made to what are known as "saddle boilers," and to the preparation for and mode of connecting or jointing the pipes.

The boiler is constructed with an additional water space extending from end to end or nearly so, and forming an internal flue. The hot draughts from the furnace pass beneath this space and return from the back of the boiler above it, and thence over the boiler externally.

The method of connecting the pipes together consists in forming on one end of each pipe about the depth of half an inch, more or less, a shallow socket to receive the other ends of the pipes, which are plain, an india-rubber washer being interposed between the meeting surfaces; the pipes are drawn tightly together by bolts, which pass through flanges on their respective ends, and the flanges act as stops to the packing.

[Printed, 4d. No Drawings.]

A.D. 1865, March 2.—N° 587.

HARTLEY, DAVID.—(*Provisional protection only.*)—The object of this invention is the construction of a core bar adapted for successive use in the casting of metallic pipes and tubes. It "consists of a central spindle or shaft, upon which is secured "any required number of rings or circular boxes, their peripheries "being turned parallel to the axis of the spindle or shaft, and "the under side of such rims being formed inclined or wedge-shaped. Three or more longitudinal segments or plates are secured outside and around these boxes by means of internally "projecting wedges, corresponding in form to the inclined under "surface of the aforesaid rings or boxes, such segments or plates "being slightly apart at their edges, so as partially to form the "core" when retained in position around the rings by means "of 'gib' and 'cottar,' and washer. Upon the outside circumference or surface of these plates ordinary moulding loam is placed, the whole forming the 'core' for the interior of the "pipe, and when the casting is complete the 'cottar,' 'gib,' "and washer are displaced, and the end of the spindle driven "back, which thus causes the boxes to be withdrawn from the

"retaining wedges secured to the outer segmental ribs or plates, such ribs closing together, and forms thereby a smaller circumference, which thus permits the withdrawal of the 'core' from the pipe or tube."

[Printed, 4d. No Drawings.]

A.D. 1865, March 9.—N° 667.

LEAHY, EDMUND.—(*Provisional protection only*).—This invention, relating to a method of strengthening collapsible tubes, refers chiefly to those tubes of tin or of lead overlaid with tin, which are manufactured for containing cosmetics, the object being to ornament and at the same time strengthen them without increasing the substance of the metal, in order that they may be capable of retaining their form under the ordinary pressure of the fingers whilst being held thereby.

The tubes are originally made by any of the known processes in use, and they are either afterwards ornamented and stiffened by corrugating them in the direction of their length, or during the process of manufacture. Four methods of producing this effect upon the tube are described, viz., 1st. By inserting the tube in a mould longitudinally grooved or corrugated internally, and forcing the metal of the tube into the grooves of the mould by the internal dilating pressure of an india-rubber or other elastic plunger, or by forcing water or other liquid into the tube. 2nd. By placing a grooved or fluted mandril or core inside the tube and applying pressure externally. 3rd. By a rolling pressure, whereby it is stated any ornate device may be produced on the tube, which may be further strengthened by a paper lining; and 4th. By the use during the process of manufacture, of corrugated or fluted dies or plungers, instead of using dies and plungers having plain surfaces. It is proposed as an additional ornamentation, to coat the tubes with colored varnishes or lacquers.

[Printed, 4d. No Drawings.]

A.D. 1865, March 9.—N° 669.

DELPÉRDANGE, VICTOR.—This invention relates to a method of connecting lateral branches to pipes forming mains, for the conveyance of water and gas, and for other purposes. The inventor says:—"I form an oblong, oval, or other shaped long hole in the main pipe, and spread or widen that end of the

“ circular branch pipe which is to be connected to the main pipe  
“ until it assumes a form somewhat similar to the aforesaid hole  
“ in the main pipe. This end of the branch pipe has a screw  
“ cut about it, and carries a nut and loose metal washer, and  
“ resting upon this washer another washer of vulcanized india-  
“ rubber or other suitable elastic material. To connect the branch  
“ pipe thus fitted and formed to the main pipe, I insert the end  
“ of the branch pipe into the aforesaid long hole in the main  
“ pipe, and turn the branch round one quarter of an entire turn,  
“ then tighten the nut against the washers and hole in the main  
“ pipe. By these means the enlarged end of the branch pipe,  
“ being crosswise of the narrow part of the hole in the main pipe,  
“ may be securely connected thereto, and disconnected therefrom  
“ at will.”

[Printed, *8d.* Drawing.]

A.D. 1865, March 11.—N° 684.

JOHNSON, CHARLES.—This is an invention of a three-way tap or valve, comprising a tubular T-piece suitable for connecting pipes. Two modifications are described and illustrated, one capable of shutting off the vertical branch from the through passage if required, and the other capable of opening a general communication, or of shutting off all or either, the valve spindle in both cases entering through a stuffing-box, and crossing the through passage in the direction of the vertical branch.

The spindles are screw threaded, and have small wheels fixed on their outer end for the purpose of turning them, and raising one valve, or of bringing the openings in the other valve into communication respectively with the passages in the triple way.

[Printed, *8d.* Drawing.]

A.D. 1865, April 1.—N° 924.

BURT, GEORGE.—This is an invention designed for forming spirally on taper and other pipes, grooves, flutes, beads, and other ornate devices.

The apparatus employed is similar to a screw-cutting lathe, furnished with a bed screw and change wheels. The milling, fluting, or beading tools are carried by a chuck, which is caused to slide along the lathe bed between the headstocks by the screw, at a speed, regulated in relation to the revolutions of the lathe



spindle, by change wheels in the ordinary way. Fitted upon the face of the chuck relatively in trigonal position and each on radial lines, are three guides, each of which contains a sliding tool-holder carrying at its inner end, a roller, cutter, milling, or other tool suited to the required style of ornament to be impressed or graved upon the tube, which is placed on a mandril that is mounted between the lathe centers, and passes directly through the center of the sliding chuck. The simultaneous convergence of the tool-holders, and the pressure of the tools upon the surface of the tube, is effected by three eccentrically curved slots formed in a cam, that is fitted on the face of the sliding chuck. When tapering tubes are to be ornamented, longitudinal guide rods which pass, one through each tool-holder, are fitted between the headstocks, all relatively inclining to correspond with the tapering form of the mandril and tube.

[Printed, 1s. 4d. Drawings.]

A.D. 1865, April 13.—N° 1058.

COTTERILL, CHARLES FORSTER.—This invention relates to the formation of the connecting sockets of pipes adapted to the conveyance of water, gas, and such like purposes, and also to a cement or composition applicable to pipe joints.

1st. Making the socket on the end of a pipe coniform, or of gradual decreasing diameter towards the open end, which is just capable of admitting the spigot end of the pipe about to be connected thereto, and when the latter is inserted the space in the socket is filled with melted lead or other suitable substance, which when set assumes the form of a conical ring or annular wedge, and any increase of internal pressure only serves to compress it, and make the joint or connection more tight and secure. A small hole is made transversely through the metal of the socket, for the purpose of pouring in the melted metal.

2nd. The composition suitable for cementing the connecting joints of socket and other pipes, consists of two parts by weight of pitch, to three parts by weight of sand, which is mixed with the pitch whilst the latter is in a melted state; if allowed to cool it must be re-melted before use. It may be used instead of lead to fill the space in socket joints, or beneath loose collars when employed to cover the meeting surfaces of pipes. This composition cools without contracting.

[Printed, 8d. Drawing.]

A.D. 1865, April 21.—N° 1122.

CANHAM, RICHARD.—This invention relating to the casting of metals, refers to apparatus for raising and lowering the mould boxes, and to the formation of cores. It is in part supplementary to a prior invention, the Letters Patent for which bear date August 12, 1863, No. 1990.

The object of the present invention is to obtain greater steadiness than is afforded by the rack and pinion mechanism, described in the former invention as adapted to the purpose of raising and lowering the mould boxes and patterns from the table, and to this end four kinds of apparatus, respectively differing in their arrangements are described. In the first two the weight of the moulding boxes is counterbalanced, the part by which they are lifted being connected to one end of a chain which passes upwards over a pulley, and has a weight depending at the other end, motion in one case being imparted by a toothed sector and pinion in combination with a lever and connecting rod, and in the other by an endless chain which is passed round and hangs loosely from a pulley on the pinion shaft.

The third apparatus is operated by means of either hydrostatic or by pneumatic power, the lifting apparatus being supported by the head of the ram, and rising and falling therewith; it is free to turn on the head of the ram in either direction horizontally, and when adjusted is fixed by locking pins; an arrangement for turning the boxes is also made a part of this apparatus.

The fourth modification consists of a horizontal arm, which projects from a block, fitted to slide up and down on a vertical shaft; the arm has an upper flat surface for carrying the mould box, and through it (reaching from end to end) there is a shaft, which when turned by a hand wheel, causes the arm to move up and down as required.

Three modifications of apparatus for making pipe and other cores for casting hollow articles, are also described. The first forms the core by means of a pair of compressing dies, one of which is fixed to the bed or plate, and the other is free to move to and fro when actuated by a lever handle. When finished and vented, the core is forced from the dies by a bolt. The other modifications are adapted to the making of cores for casting hollow vessels; also for drum pulleys.

[Printed, 3s. 6d. Drawings.]

A.D. 1865, May 1.—N° 1206.

**STEWART, DAVID YOOLOW.**—This invention relates to casting pipes, and consists of apparatus designed for making vertical moulds, and other apparatus adapted to forming horizontal moulds.

1st. Vertical moulds are rammed in a suitable box upon a pattern consisting of two parts, one representing the body of the pipe, and the other or lower part the socket or faucet. The pattern for the body of the pipe is comparatively short, so that as the moulding proceeds, the pattern is moved forwards or upwards on a central bar at successive intervals, until a mould is produced equal to the full length of the pipe. The movement of the pattern is effected by a pinion, that engages with the teeth of a rack formed in the bar, which is made round in order to pass through a central hole in the faucet part of the mould, and through a guiding hole in the plate below. The bead on the spigot end is made in three parts, and is placed on the pattern when that part of the pipe is about to be moulded.

2nd. This part relates to moulds made in horizontal position from entire patterns, which are capable of being rotated on their axes when in the sand, the mould boxes employed being in two parts or halves. An important feature in this modification, consists in taking off the opposite sides of the pattern, a longitudinal shaving, so as to cause the pattern along two of its opposite sides to be slightly flat, and these flat parts are laid in the mould box one beneath and the other above. When the sand is rammed into the upper part of the box, and before it is lifted off the pattern, the latter is turned on its axis to smooth the mould, and the flattened sides are brought exactly opposite or level with the parting, so as to leave the sand with sharp corners, which are not disturbed when the pattern is lifted out.

[Printed, 10d. Drawing.]

A.D. 1865, May 2.—N° 1229.

**ALLCOCK, THOMAS.**—This invention relates to a mode and apparatus adapted to the polishing and finishing processes in the manufacture of metal tubes, the object being to lessen or avoid manual labour, and improve the mode of polishing. To this end is employed "a revolving drum or barrel, lined internally with "buff, felt, or other suitable material, into which the tubes or



“ rods are placed in considerable numbers at one time, together  
“ with some sharp cutting grit or grinding medium, such as emery,  
“ ground glass, or pounded brick; the barrel or drum is then  
“ caused to revolve by steam or other power, by which motion the  
“ tubes or rods are violently agitated, and the surfaces are ground  
“ and polished. The quality or nature of the grinding material  
“ used I select according to the nature of the operation. For  
“ floating or removing the rough coat of the tube or rod I should  
“ employ a coarse cutting grit, whilst for polishing I should select  
“ a finer or less cutting one. By this process I effect a consider-  
“ able saving of manual labor in finishing and polishing tubes  
“ and rods.”

[Printed, 8d. Drawing.]

A.D. 1865, May 10.—No 1295.

HARTLEY, DAVID.—(*Provisional protection only.*)—This invention relates to apparatus adapted for use in forming or making the sand moulds for casting metallic pipes, tubes, or other articles of cylindric form, the object being to economise labour and expedite the process. It consists “ in the novel employment  
“ and use of a ‘strickle’ or template revolving on an axis supported on the moulding box, and parallel to the outer circumference of the cylinder to be cast; the profile or outer edge of  
“ such ‘strickle’ is formed to correspond with the shape or  
“ design of the casting required, so as during its revolution to remove the loam according to the varying shape of the mould  
“ required. When the revolving ‘strickle’ is employed to form  
“ moulds of large dimensions, such as supporting pillars and  
“ similar castings, the groundwork or foundation of the mould  
“ contained within the moulding box is to be permanently filled  
“ up with brickwork; the moulding loam is then to be plastered  
“ on to the inner surface of such brick mould, after which the  
“ ‘strickle’ is caused to revolve as described to form the surface  
“ into the design required, which produces a smooth and even  
“ surface upon the ‘loam,’ and thereby forms an effectual mould  
“ for the cylindrical casting without the use of the solid pattern  
“ now employed. When a mould for a curved tube or ‘elbow’  
“ is to be formed, the above described method may be used to  
“ form the flange or ornamental cap, and the curve of the tube  
“ is formed by means of a groove or template, in which a profile



" moves to remove the loam according to the shape of the  
" template or guide."

[Printed, 4d. No Drawings.]

A.D. 1865, May 11.—N<sup>o</sup> 1311.

MOUNTFORD, GEORGE, and WORROLL, EDWARD.—This invention relates to apparatus adapted to cutting and smoothing the surfaces of metal pipes, as also to the surfaces of rods, bolts, or bars; it is also capable of cutting screw threads on pipes and articles. The apparatus is somewhat similar in construction to an ordinary screw stock, and operates by means of a cutter or cutters or other suitable tools, capable of being advanced and maintained in position whilst cutting into, smoothing, or shaving cylindrical surfaces, by means of screws. When the cutters are fixed in the stock, the latter is moved round the pipe or article by the handles, and the cutters being forced into action by the screws, according to their form, are caused either to shave the surface or cut into the metal. "Cutters can also be applied for  
" chasing screw threads at once on the cylindrical surfaces; the  
" dies may be traversed in connection with the cutters, which  
" can be applied or secured to the stock in various ways, such  
" as by means of screws, wedges, or eccentrics."

[Printed, 8d. Drawing.]

A.D. 1865, May 15.—N<sup>o</sup> 1341.

DEAKIN, WILLIAM, and JOHNSON, JOHN BAGNALL.—This invention is supplementary to three Patents granted to James Thompson, and dated and numbered respectively April 24, 1863, No. 1024; January 19, 1864, No. 139; and, November 9, 1864, No. 2784, of which Patents the present inventors became the registered proprietors. The above patents relate to the manufacture of gun barrels and ordnance, and essentially to the treatment of the blooms or blocks of metal prepared for the same, and which previously to being drawn out and extended by hammering and swaging, and subsequently by drawing or passing through rollers suitably grooved, are made tubular by a process of punching, the punches employed for the operation being so formed, that the metal is perforated in a heated state without the removal of any of the central portion of it in the form of a pellet

or burr, so that a lateral displacement and consequently a radial compressing effect is produced upon the metal and its quality is thereby improved.

The present invention consists in the preliminary operation of first drilling a small hole concentrically through the bloom or block after it has been reduced to the desired shape by swaging and hammering, and before being operated upon by the punch; this hole serves to lead the punch in the required direction, and great mechanical accuracy in the concentric position of the punched hole is thereby ensured; the subsequent stages, and the finishing operations of the manufacture being effected according to the processes described in the Specifications of the Patents referred to.

[Printed, 4d. No Drawings.]

A.D. 1865, May 23.—N° 1411.

M McNALLY, EDWARD.—This is an invention of apparatus designed for cutting or forming either left or right handed screw threads, and applicable also to cutting or severing tubes and pipes.

It consists of a cutter with two cutting edges, and when applied to lathes it has either one or other cutting edge so directed in accord with the direction of motion as to act like a chasing tool, but when used in stocks and screw cutting machines its position must be regulated according to the thread required. When mounted it has liberty to oscillate on its outer end, so as to direct either one or other of its cutting points in a position to operate, and cut left or right handed according to the direction in which it is turned.

When employed for cutting or severing pipes, the screw cutting or chasing cutter is removed, and a cutter with two single cutting points is substituted for the purpose. The block which holds the cutter in a sector-formed recess is caused to approach and cut into the pipe by the turning of a screw formed on the inner end of one of the handles.

[Printed, 8d. Drawing.]

A.D. 1865, May 25.—N° 1429.

LAW, DAVID, and BENNET, JAMES.—This invention relates to the making of cores and moulds for casting pipes and other

articles, by means of apparatus contrived to operate by a rolling action, whereby it is stated superior work is produced, and rapidity and accuracy obtained. As arranged for making the cores for pipes of small size, the apparatus, "according to one  
" modification, comprises two pattern pulleys, which have their  
" peripheries each shaped concavely, so as to be in radial section  
" a counterpart of one-half of the core as sectioned transversely.  
" The pulleys are fixed on vertical spindles fitted with toothed  
" wheels, which gear with a fixed rack, or with two racks, and  
" which cause the pulleys to turn as they are moved horizontally  
" along. A table or plate is arranged immediately below the  
" pulleys, and the core bar is set upon brackets at the ends, so  
" as to be raised a little above the plate. The sand or mould  
" material to form the core is piled up on the plate and over the  
" core bar, its quantity being measured by preference by a box  
" with open top and bottom, which is placed on the plate, and  
" has the sand filled into it, being afterwards removed and leav-  
" ing the sand. The pulleys are then traversed along, and they  
" compress and roll the sand or mould material into the required  
" form upon the core bar. An air hole is formed by a rod which  
" moves with the pulleys, being carried by a bend which passes  
" through the sand in advance, the sand being closed over by the  
" following nip of the pulleys. Three or more pulleys may be  
" used instead of two, and the plate with the sand and core bar  
" may be traversed along whilst the pulleys turn about stationary  
" axes. The core bar may be made to rotate whilst the core is  
" being formed on it.

" In making a half mould for the outside of a pipe by similar  
" means, a single pattern pulley is used, and has a part of its  
" periphery shaped convexly, so as to be in radial section a  
" counterpart of one half of the pipe as sectioned transversely.  
" The pulley is arranged on a horizontal axis, and by means of  
" a toothed wheel and rack is made to turn whilst being moved  
" horizontally over a flask or mould box supplied with sand or  
" mould material. The pattern pulley in moving along com-  
" presses and rolls the sand into the required form. The pat-  
" tern pulley may be shaped with two or more half patterns, so  
" as to make two or more half moulds side by side in the same  
" box."

[Printed, 1s. 2d. Drawings.]



A.D. 1865, May 25.—N° 1434.

JOHNSON, JOHN HENRY.—(*A communication from Joseph Harrison, junior.*)—This invention relates to the cores and moulds of sand employed in casting pipes, the object being to draw off by means of a vacuum at the moment of casting the gases which are suddenly generated when the metal is poured, and which tend to produce imperfect work. The core is formed upon a perforated tubular core bar, suitably provided at the ends with the means of attachment to an air pump or vacuum chamber. When the casting is poured, the air-pump being previously set to work or the connection with the vacuum chamber opened, the gases generated in the mould are immediately exhausted, and either drawn through the hollow core bar and thence discharged by the pump, or are drawn into the vacuum chamber, according to whichever of the two arrangements are adopted for their expulsion. By this means it is stated "the core or mould is  
" thus much more effectually vented than when the gases are  
" taken off in the ordinary manner, whilst at the same time, in  
" consequence of the partial vacuum which takes place through-  
" out the whole length of the core, the sand forming the core is  
" relieved of the pressure at or near its centre, the pressure of  
" the atmosphere being against its external surface; the whole  
" core is much strengthened, and a better class of casting is the  
" result."

[Printed, 6d. Drawing.]

A.D. 1865, June 2.—N° 1517.

PRITCHARD, THOMAS.—The object of this invention is to improve the construction of the furnaces employed in the manufacture of welded iron tubes, which furnaces ordinarily depend entirely upon the chimney for the current of air that support combustion in the furnace, and thence draws the hot draught through the heating chamber. The inventor says:—"I introduce  
" a blast of air into the heating chamber, the said blast entering  
" the said chamber nearly opposite lower than the said bridge. The  
" but at a point considerably lower than the said bridge. The  
" heating chamber at the part where the blast of air is intro-  
" duced is of much greater depth than the remaining part of the  
" said chamber, into which the strips or skelps of iron are intro-  
" duced to be heated. The blast of air described is introduced



“ by means of a tuyere or tuyeres, and its quantity is regulated  
“ by suitable valves or dampers. In the lower part of the heat-  
“ ing chamber into which the blast of air is delivered, ignited coa-  
“ or coke is placed, the blast producing by its action on the fue  
“ a gaseous combustible mixture, which, mingling with the fire  
“ from the fire-place, produces a continuous sheet or body of  
“ flame, which extends through the whole length of the heatins  
“ chamber, and heats the strips or skelps of iron to be made  
“ into tubes very rapidly and with great uniformity, especially at  
“ the leading end of the furnace, that is, the end from which the  
“ heated strips or skelps are drawn out. Although I prefer  
“ introducing the blast of air at the point of the heating cham-  
“ ber described, yet the said blast may be introduced at other  
“ points of the heating chamber with nearly the same effect,  
“ provided it is introduced into the ignited fuel in the said  
“ chamber.”

[Printed, 8d. Drawing.]

A.D. 1865, June 3.—N<sup>o</sup> 1527.

TAYLOR, CHARLES.—This invention relates to handstocks de-  
vised for cutting or severing tubes, also to stocks and dies for  
screw cutting.

“ The body of the tube cutter consists of a hooked or claw-  
“ shaped hollow support, the said support being angular and  
“ open at one side; within this support the tube to be cut or  
“ divided is placed. Made in one piece with the said support, is  
“ a hollow cylindrical block in a hole, in the axis of which a screw  
“ box is made, the said screw box being cut out of the solid. In  
“ the said screw box a screw works, one end carrying a handle  
“ by which it is turned, the opposite end of the said screw being  
“ connected to a rod which carries at its end a circular cutter;  
“ this cutter rod works in one end of the hollow cylindrical block  
“ described, and is capable, by the motion of the screw, of being  
“ advanced from and withdrawn into the hollow support, but the  
“ said rod is incapable of rotatory motion. The bottom of the  
“ support adjoining the cylindrical block is recessed or cut away,  
“ and in the said recessed part the cutter rod is partly embedded.  
“ The said recessed part constitutes a bearing or support for the  
“ cutter rod, and prevents lateral motion in the said rod. The  
“ tube to be cut or divided being placed in the hollow angular

“ support, the circular cutter is advanced against the tube by turning the handle of the screw. By rotating the tube cutter about the tube as a centre, and gradually advancing the cutting tool, the tube is cut or divided at the part situated in the hollow support.”

The screw stocks contain four quarter dies, fitting to side dovetails, and secured by pins which fit laterally, half into each die, the cutting contact being regulated by a screw. By substituting dies with single cutting points, these stocks may also be employed for severing pipes and tubes.

[Printed, 1s. Drawings.]

A.D. 1865, June 30.—N° 1738.

TIPPER, HENRY POWELL.—This invention relates to a process of manufacturing gun barrels from tubular ingots of cast steel or homogeneous iron reduced and elongated by hammering and rolling. The external mould for casting the ingot vertically is made in two parts of cast iron, and fitted with a cast iron or tubular steel core, both relatively so placed and proportioned in size, as to form the metal of the ingot half an inch thick, the core being coated with black lead or blacking to prevent adhesion. A sand core may be used. The molten metal is raised to a high temperature, in order to liquify it as much as possible. When taken from the mould the ingot is re-heated, and submitted to a tilt or steam hammer to render it dense and solid. Previous to the rolling process, it is again re-heated, and in this state passed through the rolling machine, which consists of three rolls, all having a corresponding series of circumferential grooves, which graduate in size. The axes of these rollers are mounted horizontally, to revolve one above another in bearings resting in side frames or housings, the grooves of the central roller matching and pairing with the grooves of the other two, top and bottom. The heated ingots are passed through in one direction between the top and middle rollers, and returned between the middle roller and the bottom, suitable adjustable mandrils, which terminate between the grip of the rollers, being provided to present and receive the ingots as they are passed to and fro through the rolls, and in this way, by a succession of passes, the ingots are gradually drawn out and reduced, suitable rests and arrangements for supporting, guiding, raising, and holding the ingots and man-

drills being fitted at each side of the machine. Barrels for breach-loaders are cast in moulds, and rolled by rollers recessed to form the necessary enlargement at the butt end.

[Printed, 1s. Drawings.]

A.D. 1865, July 1.—N° 1749.

ATKINS, JAMES.—This invention relates to the manufacture of compound tubes, comprising a tube of iron internally, having an unwelded joint, and coated or covered with a thin tube of brass; also to ornamenting metallic tubes and rods.

The iron tube is, when prepared with a suitable flux, such as chloride of zinc, plunged in a bath of molten tin or solder, which adheres to the metal of the tube and forms a coating. The tube thus coated is slid into the covering tube of brass, and in this state it is again plunged into the bath, and by this means the space between the tubes is filled with the molten metal, which when set and cold solders the tubes together. If the brass tube is not required to be coated externally, the adhesion of the molten metal is prevented by painting or coating it with whiting or pipe-clay; compound tubes made by this process do not corrode between the metals.

The mode of ornamenting tubes consists in coiling helically or otherwise, ornamented strips or ribbons of brass or other suitable metal, or weaving, braiding, or plaiting upon the tube metal strips or wire.

[Printed, 1s. Drawings.]

A.D. 1865, July 15.—N° 1858.

HINGLEY, SAMUEL.—The object of this invention, relating to the making of skelps for iron and steel tubes, and to the machinery employed, is to avoid the necessity for reheating and bending the strip by the ordinary "crocodile" machine, or by the machine called the "bell," by causing the machinery as the strip leaves the rolls to bend it without any additional force; the skelp thus formed is uniform in shape throughout its length, and it can be more readily drawn by either of the above-named machines. The flat strip, having for the last time passed through the rolls, is directed into a shaping box or frame, which is made in two parts or halves, and so fixed at the back of the rolling machine that the flat strip enters it as it leaves the rolls. "The box or frame



“ is hollow, and so shaped internally that the flat strip, as it is  
 “ driven through it by the rolls, is gradually coiled, and leaves  
 “ the box or frame at the opposite end an oval shaped tube with  
 “ an open seam and a flat end, and is, when the ragged end is  
 “ cut off, a skelp ready for welding into a tube, without requiring  
 “ further heating, bending, or shaping, by means of a crocodile  
 “ or a bell, or by any other means now in use. The box or frame  
 “ is opened, as each skelp is finished, to admit the escape of the  
 “ butt end of the skelp.”

[Printed, *sd.* Drawing.]

A.D. 1865, August 8.—N° 2055.

MESSENGER, THOMAS GOODE.—(*Provisional protection only.*)

—“ This invention relates to an apparatus devised for cutting  
 screw threads on pipes and rods, and adapted to cutting or  
 severing pipes. It “ consists of a frame having a hole on each  
 “ side, through each of which holes is passed a flanged pipe, its  
 “ flange being about the centre of the length of the pipes, and  
 “ it is secured to the framing by screws passing through the  
 “ flanges into the framing, or the pipes may be screwed into the  
 “ framing itself. The portion of each pipe which stands within  
 “ the framing is tapped with a screw thread, and upon these  
 “ pipes a cylinder is free to turn, tapped at each end to receive  
 “ the screwed ends of the pipes. This cylinder has two or more  
 “ chambers at the side, in each of which a cutter or chasing tool  
 “ is free to slide, the distance between the points of which is  
 “ regulated by a clamp, which has a right and left handed screw  
 “ at one end, arranged so as to be turned by a hand lever (or  
 “ by equivalent contrivance). One of the first-mentioned  
 “ threaded pipes has on its outer end chambered projections,  
 “ through which pass the stems of a pair of V-champs, the outer  
 “ ends of the stems of which are held by a clamp frame in such  
 “ manner that the clamps may be moved nearer to or farther  
 “ from each other by means of a screw. These V-clamps are  
 “ employed for placing and receiving a pipe, rod, or bar, on  
 “ which a thread is required to be cut in the centre of one of the  
 “ first named screwed pipes ; the other screwed pipe is provided  
 “ at its outer end with a cone or its equivalent, which receives  
 “ the end of the pipe to be operated upon. The chambered  
 “ cylinder before mentioned is provided at one end with a spur  
 “ wheel, the teeth of which gear into and slide in a similar wheel



“ which forms part of or is connected with a bevel wheel, which  
“ is moved by another wheel actuated by a hand winch. The  
“ machine is provided with legs or with a stand, so that it may  
“ be used either upon the ground or upon a bench.”

The apparatus adapted for cutting pipes is similarly arranged.

[Printed, 4d. No Drawings.]

**A.D. 1865, August 29.—N° 2215.**

ROBINSON, GEORGE.—This invention relates to the construction of the sand moulds employed for casting pipes and cylinders, and other articles hollow or otherwise. The mould box is made in two or more longitudinal sections or parts, hinged or otherwise arranged to close and form a long cylindrical cavity to receive the sand, which instead of being rammed in round a pattern or model in the usual way, is mixed with loam and rammed into a number of short cylinders, which are previous to use, dried in the usual way. These cylinders are placed close together and to end in the mould box, one of special form being placed at one extremity to form the socket, and interstruck passing alternately through them is the core, the intermediate sections again forming the mould, which may be separated either vertically or horizontally to receive the molten metal.

Moulds for retorts, cylinders, and other similar articles are formed by a repetition of sections in short parts, previously moulded and tried in the same manner and shape, and is cut in a suitable mould box, the interstices if any between their meeting ends, being filled up with sand and made smooth. The sides or parts of the mould when may in short and when short make secure in various ways, and the moulds may be either separated or extended by using a cover or greater addition of the short, very good cylinders.

Printed at Government Press.

and other things in the way of

[illegible]

“ an ordinary parallel mandril or a hollow mandril (through which water may be passed when in use) to travel with the collar or tube between each series of rolls; by this means the steel or other metallic collar is elongated on the mandril and rolled into a tube. It is then passed with the mandril inside between horizontal rolls such as are at present in use (each revolving in the same direction), and drawn nearly in a line with the axes of the rolls. This operation will free the mandril and admit of its being withdrawn easily from the tube.”

[Printed, 4d. No Drawings.]

A.D. 1865, September 14.—N<sup>o</sup> 2351.

**HARDING, GUSTAVUS PALMER.**—This invention relates to an hydraulic apparatus adapted to the manufacture of tubes for gun barrels, and also applicable to the manufacture of rods and bars and to rifling ordnance and fire-arms. It consists in:—

1st. The employment of “ dies or wordles ” composed of two or more segmental dies or disc rollers, having formed on their peripheries tapering or other shaped grooves. These segments or roller dies are so placed relatively that their peripheries converge to a common center, the axis of each being mounted and capable of turning in bearings disposed in a frame, which is fixed to the hydraulic cylinder, the tubes which are operated upon according to one arrangement being drawn through the dies by the piston, to which they are connected. It is however preferred “ to work the expanding dies or wordles in pairs in one machine, each die or wordle in turn acting as a grip to hold the tube and draw it through the other die or wordle; for this purpose the tapering gear of the die or wordle then acting as a grip will be put out of gear, and the segments of which the die is composed will approach each other until they have sufficient grip of the tube to hold it whilst being drawn. In this arrangement I find it convenient to employ a pair of hydraulic cylinders mounted in a suitable framing, one die or wordle being supported in a cross frame between the heads of the cylinders, the other die or wordle being mounted in a cross head connecting together the ends of the piston rods; in this case there will be two racks and two sets of gearing to work the two dies or wordles, the one set being carried by the cross head connec-

“ting the two piston rods, whilst the other set is carried by the cross frame connecting together the hydraulic cylinders, the mandril on the one side being carried by a cross frame connecting together the opposite ends of the cylinders whilst the mandril on the opposite side is held in another frame connected to the cross head of the piston rods.” When operating on rods the mandrils are dispensed with, and when irregular forms are required, the grooves in the dies are shaped accordingly.

2nd. The rifling of the tubes for gun barrels or ordnance, is effected during the drawing process by means of a mandril having mounted on its end a bulb furnished with helical indentations or projections and free to turn whilst the drawing is in progress. By this means the rifling of gun barrels is accomplished by the revolving head of the mandril whilst the tube is passing between the compressing dies. Letters Patent, A.D. 1861, No. 2533, are referred to.

[Printed, 1s. Drawings.]

A.D. 1865, October 5.—N° 2552.

HUGHES, KESKETH. — This invention relates to machinery adapted for shaping by means of rollers and cutters, metals in the form of tubes, bars, axles, and other similar articles. One of the main features in the invention consists, in the construction of the grooved or otherwise shaped rollers employed. For rolling and reducing cylindrical tubes, the two rollers are furnished with a coinciding series of circumferential grooves graduating in size, the groove round one end of each roller being much larger than the groove round the other end, whilst the size of the intermediate grooves regularly graduates from the largest to the smallest. The rollers are formed in two parts, there being a longitudinal segmental portion of the periphery of each roller fitted to slide in a dovetail groove a limited distance to and fro each revolution of the roller in the direction of their axes, for the purpose of shifting the tube or rod across the rollers from groove to groove in succession, during which time the rollers continue to revolve. This movement of the grooved sliding segments is effected by fixed inclines on the housings, against which corresponding inclines on the ends of the sliding segments strike. The rollers are caused to rotate uniformly by tooth gearing, and the sliding movement takes place when the sliding segments come round and grip the

tube, which by the movement is shifted exactly opposite the next groove, and so on in rotation until all the grooves are traversed. " In some cases I use guides fixed in the rolls to propel the " article through the machine instead of the sliding section ; " these guides act in a similar manner to that described in the " Specification of Letters Patent granted to me 30th March 1863, " No. 819. In connection with the rolls I sometimes use a " drawing apparatus geared to the rolls with a revolving swive- " grip for rolling and reducing seamless and other tubes, rods, " bars, and articles. I also employ cutters for the purpose of " turning, scraping and otherwise finishing the articles as they " revolve by the action of the rolls. These cutters are fitted to " the machine and are of hardened steel sometimes circular with " the pattern cut into them ; they revolve on their axes, and as " the rod, wire or other article passes through the rolls, the " rotation imparted by the rolls to the article is sufficient to " produce a turning or scraping of the surface by the cutters. " I sometimes use a cutter or cutters like turning tools of the " shape of the article, and which have a rising and falling or " receding motion, so that they come into action while the article " is being shaped by the rolls, and rise, fall, or recede when the " sliding or propelling power of the rolls acts. In some cases " it is necessary to heat the metal before passing it through the " machine."

[Printed, 1s. 6d. Drawings.]

A.D. 1865, October 30.—N° 2795.

DEAKIN, WILLIAM, and JOHNSON, JOHN BAGNALL.—

This invention relating to the " manufacture of ordnance, whole " or in parts," is supplementary to former Letters Patent granted to James Thompson, and of which it is stated the present inventors became the registered proprietors. These said Patents consist of two, dated April 23, 1863, Nos. 1023, and 1024, and two, dated and numbered respectively January 19, No. 139, and November 9, No. 2784, both in the year 1864. Also to an application for Letters Patent made May 15, 1865, No. 1341. As regards the present invention :—1st. The block or mould of metal intended to form a gun is, after having been perforated and made wholly or partly tubular by a suitable punch, subjected to a hammering and swaging process upon a slightly tapered mandril,



and subsequently, in order to further extend it lengthwise and correspondingly reduce its size transversely, it is passed between grooved rollers, on to a fixed mandril with a tapering bulb or enlargement on its free end, which reaches to and lies in the grooves between the rolls. When the hammered mould is presented to and gripped by the rolls, it is forced over the enlarged end of the mandril on to its stem, and instead then of dismounting the mandril and slipping the mould or partially formed tube or barrel off its back end, the action of the rolls is reversed, and the tube is pushed back into the grip of the rolls, which draw it back over the mandril head. The mandril stem is made laterally adjustable, so as to answer to the several grooves in the rolls, and it is furnished with heads graduating in size; these heads are screwed on and off as the tube is presented in turn to the different sized grooves in the rolls, and during the process the mandril is kept in a cool state by cold water, which flows through it to the end and returns.

2nd. Relates to the making of medium sized guns, composed of two tubes one within the other.

3rd. Relates to the manufacture of ordnance of large dimensions which are built up of parts upon a seamless tube [made according to the first part of this invention, the object being to bring into effect what is called a "segmental or lateral straightener" or straightening apparatus.

[Printed, 1s. Drawing.]

A.D. 1865, October 31.—N° 2804.

DESLANDES, ARTHUR. — (*A communication from Alfred Bertsch.*)—This is an invention and arrangement of apparatus designed for forming or preparing, and drying the sand moulds and cores employed in the casting of metallic pipes, tubes, and other similar hollow articles. The operation is carried on in the basement of the foundry, on the ground floor of which are arranged three cranes which have travelling chain carriages that sweep over the area of the floor below, where lines of rails are laid, for the trucks which carry the vertical mould boxes to travel upon; a number of these trucks follow each other through the successive stages of the operation, the first of which consists in forming the moulds by means of a mechanical rammer, to which vertical reciprocating action is given by means of a crank shaft and connecting rods, the core if desired being rammed and formed at

one operation with the mould, which when completed is moved on to be dried over a pipe whence issues into the mould a current of heated air; thence the trucks are in succession taken on the rails to the casting department where the molten metal is to run into them. The object of the invention being to lessen labour and expedite the casting of pipes and such like articles by means of a sufficient number of vertical mould boxes and sand moulds mechanically rammed, and passing in rotation through the different stages of the process by means of the cranes and the tramways.

[Printed, 1s. 4d. Drawings.]

A.D. 1865, October 31.—N<sup>o</sup> 2805.

**EMMET, CHARLES.**—This invention has for its object the construction of steam hammers with a view to render them self-acting, and the adapting them to general use for smith's work, and rivetting boilers and pipes.

1st. By means of the self-acting apparatus, the action of the piston whatever the length of stroke, is reversed immediately after the hammer has delivered a blow. This is effected by the momentum of a weight, supported on a spring attached to and carried by the piston rod, to which also is attached a bell-crank lever that operates upon a similar lever hinged to the cylinder; the free end of the latter lever being connected to the valve spindle, shifts the valve when the momentum of the weight at the moment of concussion overcomes the spring, the valve shutting off the steam and opening the exhaust.

2nd. Regulating the speed and force of the blow of a steam hammer by means of a treadle (when forging smith's work) acted upon by the workman's foot. The treadle acting on the throttle valve regulates the supply of steam.

3rd. Apparatus adapted to steam hammers employed in rivetting boilers and pipes. This apparatus is cruciform, comprising "a central boss with four arms projecting at right angles to each other, which are capable of being adjusted by nuts and screw threads, so as to fix the apparatus within the boiler. A square bar is fitted into a hole formed through the boss longitudinally of the boiler, which is capable of sliding or being moved therein by a screw and nut or by rack and pinion; also a round bar or spindle is fitted through the hole longitudinally

" of the square bar, and capable of rotating therein. A projecting  
" arm is formed or fixed on one end of the round bar, suitable  
" to fix a steam hammer upon, having also provision made to  
" carry a worm arranged to gear in a worm wheel fixed on the  
" end of the square shaft, by means of which the hammer can be  
" moved around the inner surface of the boiler or tube as  
" required."

4th. So constructing steam hammers, that the planes of the surface of the anvil and of the hammer face respectively are made relatively adjustable by a movement of the anvil, so that articles may be forged with surfaces inclining to the angle required.

[Printed, 1s. 8d. Drawings.]

A.D. 1865, November 15.—No 2943.

COCHRANE, HENRY.—The object of this invention is to improve the constructional arrangements of the stoves described as applicable to the drying of moulds in the Specification to Letters Patent granted to A. B. Cochrane, and A. Slade, and bearing date January 3, 1850, No. 12,918. According to the present invention instead of causing the flames and hot gases to pass direct into a flue inside the mould, they are first conducted into a vertical flue which may either run down the space between the outside of the mould and the surrounding casing, or be formed against the outside of the casing, and in either side made to communicate with a flue or flues formed beneath or in the foundation plates whereon the mould boxes stand over a series of flue openings, through which the gases having given off a great portion of their heat, pass up and through the moulds whence, together with the steam generated thereby in the moulds, they escape through openings in the top of the mould boxes. By placing the vertical flue in a central position in the stove and communicating with a series of radiating branches in the foundation, a circumscribed number of moulds for pipes or other hollow articles may be more readily dried, the heat being more equable.

The fire-place or furnace according to another arrangement instead of being at the top of the stove, is fixed against the side of the casing, and the gases having been conducted to the top of the stove, are distributed through pipes and pass downward through the moulds. Portable stoves for drying hollow moulds, and constructed under this arrangement are also described.

[Printed, 1s. 4d. Drawings.]



A.D. 1865, November 27.—N° 3036.

BARAGWANATH, JOHN PHILLIPS.—(*A communication from Henry Hitchings Baragwanath and Martin Van Wisker.*)—(*Provisional protection only.*)—This is our invention of a combined tool or instrument capable of use either as a spanner or screw-key, a cutter for severing pipes, and as a wrench or tongs for screwing or unscrewing pipes and couplings. It “consists chiefly of a “straight bar carrying two jaws one fixed and one adjustable, a “cutting blade and gripper being provided which are capable of “being attached to or removed from the implement when required. When neither the said cutting blade or gripper are “attached, the implement will form a light, strong, and convenient spanner, capable of adjustment to suit any ordinary sizes “of nuts or bolts. The straight bar is by preference rectangular “in section, and has screw threads formed for a portion of its “length on two sides thereof. The sliding jaw is provided with “a nut having screw threads which correspond with those on the “straight bar. By turning this nut the shifting jaw is moved “nearer to or farther from the fixed jaw, and the spanner is “thereby adjusted to the required width between the two “jaws.”

“When the implement is to be used as a tube cutter, the “cutting tool which is provided with a long shank, is inserted “into a small socket formed in the sliding jaw. The length of “the shank causes the tool to be firmly sustained in this socket, “and for further security the socket is provided with a spring “catch arranged to drop into a small recess formed on the shank “of the cutter. The implement is adjusted with the edge of the “cutting blade against the tube and is moved round the said “tube in the ordinary manner. The blade is pressed up to its “work by the nut before mentioned, which in this case may “be turned in the required direction by means of a small “spanner.”

“In using the implement as a pipe wrench the cutting tool is “removed, and the gripper, which is also formed with a shank “is inserted into the socket and held therein in the same manner as described for the said cutting tool.”

[Printed, 4d. No Drawings.]



A.D. 1865, December 5.—N° 3117.

MUNTZ, PHILIP ALBERT.—This invention is designed to improve the process of manufacturing metal tubes, as described in the Specification of Letters Patent granted to G. F. Muntz, junr., and dated May 8, 1852, No. 14,117, and which consisted in first, flattening and lengthening out a cast tubular ingot of Muntz's metal or other alloys of copper, by passing it through or between rolls with plain surfaces; next, making the tube elliptical by partially opening it; then cutting off the fin or webs formed at the two opposite edges, and giving it a circular figure and finishing by passing it between suitably grooved rollers, the tube being heated to redness prior to each rolling operation. According to the present invention, which is designed to render one of the rolling processes unnecessary, and avoid the waste produced by cutting off the webs, the inventor says:—"I first cast the short thick hollow tube in the ordinary way; I next roll it flat or nearly flat in the ordinary way; I afterwards pass the flattened tube through a pair of rolls having grooves semicircular in cross section, the said rolls being provided with a mandril for opening the flattened tube. By passing the flattened tube through the rolls last described it is directly converted into a cylindrical tube; or the flattened tube may be partially opened by means of rolls having semi-elliptical grooves in them, the longer axis of the ellipse being in a plane perpendicular to the axis of the rolls. By these rolls the flat tube is opened without the formation of fins. The elliptical tube is finally passed through the rolls having semi-cylindrical grooves, and thereby made into a cylindrical tube; I prefer however to convert the flattened tube directly into a cylindrical one, as previously described."

[Printed, 8d. Drawing.]

A.D. 1865, December 12.—N° 3214.

NEWTON, ALFRED VINCENT.—(*A communication from David Meeker Nichols.*)—This invention relates to a tool devised for the purpose of cutting boiler tubes to the proper length either before or after one end is fastened in the tube plate. It consists of a bar or shaft, having a hole bored through its axis to receive a tightening screw and a stationary and a shifting cone in combination with an expanding sleeve or other device for securing the

shaft of the tool in the center of the tube about to be trimmed or cut. The cutters are secured in a head keyed or otherwise secured on the shaft, and having a true face, beyond which the cutters are set the required distance to regulate the depth of cut, the cutters without the face being apt to lead in and by straining the tool beyond its capacity cause the cutters to break. The feed motion is effected by a wheel turned by hand. The cutters are made with projecting lips which strike the tube sheet when a tube is cut in its place, or otherwise prevent the operation taking off more than is desirable. It is necessary to provide several sizes of cutter heads and expanding sleeves to suit tubes respectively differing in size. If desired the cutters may be arranged to cut from the inside instead of from the ends.

[Printed, &c. Drawing.]

A.D. 1865, December 20.—N<sup>o</sup> 3289.

**RICKETT, THOMAS.**—This invention relates to the manufacture of metallic tubes for gun barrels and other purposes, and to the machinery and apparatus employed, the process mainly consisting in the construction of the rolling apparatus, which operates by means of four or other number of disc rollers, so mounted on axes in a suitable strong metal frame that their peripheries, which are grooved, meet at a central point, and collectively form a circular opening, the groove of each disc forming one-fourth. When tubes are required to be finished externally to other than a circular form transversely, the periphery of each roll is shaped to produce a longitudinal section of such form. The mandril employed to shape the barrel internally has an ovate form; it is attached to the end of a long mandril rod which supports it in the opening formed by the meeting of the rolls, the outer end of the mandril rod being fixed to the framework is supported by a number of sliding plates connected together by chains. Two of the disc rollers are driven by suitable gearing; the others, which are intermediate, are rotated by the friction. Guide rollers are employed for directing the end of the tube into the opening, and for forcing the tube forward until it is nipped by the rolls, which shape it externally and force it over the mandril on to the mandril rod; the action of the machine is then reversed, and the mandril rod with the tube upon it is caused to turn a portion of a revolution, so as to bring the ribs or fins *formed* on the tube by the edges of the grooves fairly into them

when the tube is returned between the rollers from back to front, and drawn off the mandril, the operation being continued until the necessary reduction and desired size of the tube is attained.

A modification of this apparatus is described as having, instead of disc rollers, a set of segments or segmental portions of rollers respectively reciprocating on an axis and employed to reduce and force a tube or barrel alternately on and off a mandril, the peripheries of the segments forming collectively at their meeting point an opening in the same manner that the opening is formed by the meeting of the rolls.

[Printed, 1s. 2d. Drawings.]

A.D. 1865, December 22.—No 3314.

DEANE, EDWARD.—The object of this invention is, so to construct pipes, tubular columns, and other hollow structures and articles of sheet iron or steel, as to add very considerably to their strength by introducing longitudinal stays and webs or partitions of sheet metal, which run through them from end to end, and divide the tube or column internally into four or any other number of sections. The inventor says:—"I construct a tube which  
" may be round, square, oval, or of any other shape to suit the  
" purpose for which it is intended, of sheet iron or of any other  
" suitable metal as may be determined, having a web or webs of  
" similar material in its interior. These are bolted or rivetted in  
" the usual way to each other and to the external tube either on  
" the inside of the tube or to flanges on the outside. There  
" may be any number of webs, but two, three, or four will be  
" generally found to be sufficient. Instead of constructing in  
" the interior of the tubular structures above referred to, I may  
" have a tubular or solid core which becomes the axis, from which  
" radiating stays may proceed, the said stays being securely  
" fastened to the external tube. . . . In the case of oars, masts,  
" and boats, and in particular constructions, I would encase the  
" steel or iron core made as above in wood. This can very  
" readily be done by known processes, and will add very greatly  
" to the lightness and strength of such constructions."

[Printed, 16d. Drawing.]

1866.

A.D. 1866, January 8.—N° 56.

GIBB, ARCHIBALD. — This invention relates to machinery adapted to the forming and ramming of the sand moulds employed for the longer class of castings, such as pipes and similar articles, and more particularly such moulds as are made in two halves or parts in long cross-barred boxes, that are separately placed, and the sand by mechanical rammers is rammed upon the model pattern, one half part of which rests in a recess in a horizontal bed plate, so the other half of the pattern is above the top surface of the plate. The bed plate moves forward at intervals mechanically under the rammers which, as the bed plate advances operate in succession between the several cross bars upon the sand, that is fed into the mould boxes either by feeding and regulating apparatus, or in the usual way by hand. Mechanism is contrived for elevating, mixing, sifting, and to some extent regulating the sand, and the length of the rammers, which have vertical action, is adjustable. As the half moulds are finished, they, having a suitable core laid in the hollow of the mould, are placed and secured in pairs face to face, each half mould box being capable of pairing with any or all the rest; previous to receiving the melted metal, the pairs of mould boxes are removed and placed either vertically or slantingly, special arrangements being made for steadying and supporting the cores, and thereby prevent any movement or deflexion thereof at the moment of casting, when the liquid metal strikes the mould.

[Printed, 1s. 4d. Drawings.]

A.D. 1866, January 9.—N° 68.

GRIMSHAW, WILLIAM DAKIN.—(*Provisional protection only.*) —The object of this invention is to construct an instrument which shall combine a wrench suitable for workers in tubes and rods of metal, and a cutter adapted to the purpose of severing metallic tubes and rods. The instrument resembles an adjustable pipe-wrench, having one fixed jaw projecting laterally at the extreme end, and one movable jaw hinged to an adjustable slide on the shaft or handle, and set up by a screw. In the serrated face of the movable jaw there is a recess and hole, formed to receive the



stud and back of the cutter, which when placed therein are shaped to correspond, and the cutting edge of the cutter projects in the direction of the face of the fixed jaw. "This cutter when removed " in no way interferes with the use of the tool as a wrench, but " may be carried in the pocket of the workman, and when a " cutting tool is wanted, by simply inserting the tool in his " wrench all filing or other laborious mode of cutting is avoided, " one turn of the wrench being sufficient to sever the tube or " rod."

[Printed, 6d. Drawing.]

A.D. 1866, January 19.—N<sup>o</sup> 172.

SUMNER, WILLIAM.—The object of this invention, relating to the casting of articles in metal, and particularly tubular ingots of brass, which are afterwards to be reduced and drawn out to form seamless tubes for boilers and other purposes, is to economise time and labour in the process by adapting thereto mechanical appliances, and to this end it consists—

1st. In conveying the crucible from the furnace to the mould on a two or four-wheel truck; the crucible rests on trunnions, and by means of screws, cams, toothed sectors, or other suitable appliance, it is caused to tilt gradually, so that its lip or edge is, whilst the metal is running out, kept at a suitable level above the mould.

2nd. Instead of securing the two halves or parts of the metal moulds by means of clamps or bridles, it is proposed to hinge them together and secure them either by pins or studs and cottars, or by swivel bolts or bridles.

3rd. Combinations of machinery for supporting the metallic moulds and cooling them when the casting has been removed. " Each mould is attached to a swivel lever supported in fixed " bearings; the end of the lever opposite the mould is counter- " weighted. When the mould is ready to receive the molten " metal from the crucible the lever is nearly vertical, being held " at the proper angle by a stop plate or otherwise; as soon as " the molten metal has been poured into the mould the lever and " mould are swivelled partly round, where they are held by a " moveable catch until the mould has been opened and the cast- " metal tube or other article has been removed; the catch is " then moved to allow the lever to assume a horizontal position,

"and the backs of the open mould then dip into a water trough by which they are cooled; the mould is then closed and otherwise prepared as usual for the next operation."

According to a modification, "two or more moulds may be connected to a swivel bar in a counterbalanced swinging frame, by which arrangement when the moulds have been opened to remove the tubes or other articles, they may be turned over to bring the backs of the moulds uppermost, which are then cooled by pouring water on them as now customary; or each mould may be provided with trunnions supported in a counterbalanced lever acting in the same manner as the swing frame above described."

[Printed, 2s. 8d. Drawings.]

A.D. 1866, January 31.—No 305.

BONNEVILLE, HENRI ADRIEN. — (*A communication from Cadet Pierre Dubuisson.*)—This invention, relating to the manufacture of wrought-iron tubes, gun barrels, nuts, and other tubular articles, consists in the use for such purposes of the wrought-iron shavings, cuttings, borings, and small pieces, made when turning, planing, and working that metal.

"To make an iron tube or a gun barrel I introduce the above material in a cylindrical or prismatic mould provided with a central fixed mandrel for forming the hole or bore. A hollow piston is used for compressing the material by means of hydraulic or other power so as to agglomerate and give it the form of the piece required. The tube thus partially agglomerated is next heated and soldered on the mandrel either by means of a steam hammer, by hand, or even by the use of rolls, and afterwards, if necessary, drawn out to the required thickness. When intended for nuts the tube may be compressed and soldered piece by piece, but it is preferred to form a tube of a certain length at a time. These tubes are soldered on the mandrel in a stamping tool or in the grooves of a flattening mill, the pieces assuming the hexagonal or square form according to the kind of nuts required. The tubes thus soldered are next cut into slices by incisions perpendicular to the axis, done on a lathe or with a saw."

[Printed, 4d. No Drawings.]

A.D. 1866, February 17.—N° 506.

WOLSTENHOLME, JOHN, and PENDLEBURY, JOHN TOMLINSON.—This invention relates to a kind of hand-stock or wrench combining two uses, viz., shaving by means of a straight flat cutter the outer surface of pipes or tubes, preparatory to cutting screw threads thereon or otherwise, and cutting or severing by means of a circular cutter, tubes and bars. At the midlength, between the handles on the ends, the stock is divided by a long slot, wherein are mounted a short distance apart two rollers, which are free to revolve on fixed studs or axes. The tube to be operated upon rests upon the periphery of these two rollers, which roll round the tube when the stock is turned, and support the tube against the pressure of the cutting or shaving tool, which is carried by a slotted lever having one end pin-jointed in the slot of the stock, and the other end capable of adjustment by a thumb screw, which by drawing down the lever brings the cutter into cutting contact with the surface of the tube, and shaves it when the stock is moved round, the tube being confined between three points, viz., the surface of the two rollers, and an adjusting plate. When employed for severing tubes, the cutting tool is withdrawn, and a circular cutter, which is fitted to revolve in the slot of the lever, is brought to bear upon the surface of the pipe by the thumb screw. Instead of using the circular cutter, the opposite end of the flat cutter may be fashioned to a cutting point, and used for the purpose of severing pipes.

[Printed, 16d. Drawing.]

A.D. 1866, February 21.—N° 538.

WEBB, WILLIAM.—This invention, relating to the manufacture of tubes and hollow cylinders, consists in—

1st. A method of increasing the diameter of tubes and hollow cylindrical shells by a rolling process, the shell revolving between two compressing rollers, one inside the shell and one outside. By this means the diameter of the cylinder or tube is increased without any appreciable or corresponding increase in the length.

2nd. The machinery employed. The uppermost of the two rollers of the rolling machine must be capable of sliding endwise, and its diameter in relation to the size of the cylinder operated upon must be so much smaller, as to be able to pass longitudinally inside it, but the lower roller may be larger. In order



to place the shell of the cylinder between the rollers, the top roller is slid endwise through an opening in one of the side frames or housings, and is received upon suitable supports at the side of the machine, and when the cylinder has been placed upon the bottom roller the top roller is slid back through it into its place; pressure is then put upon the bearings of the top rollers by setting down screws, and the rollers are set in motion and continue to revolve with the shell of the cylinder between them until the circumference of the latter is extended by the pressure, and its diameter has reached the desired size. In order to remove the cylinder it is first necessary again to slide the top roller lengthwise out of its place, but before replacing it another cylinder or tube may be laid on the bottom roller to be operated on in the same manner.

"Tubes or hollow cylinders expanded or rolled according to my invention are much stronger than tubes or hollow cylinders expanded by being rolled or drawn in the ordinary way."

[Printed, 8d. Drawing.]

A.D. 1866, February 28.—N° 611.

BROOMAN, RICHARD ARCHIBALD.—(*A communication from François Antoine Marie Boué.*)—(*Provisional protection only.*)—This invention relates to the method of casting metals in cast-iron moulds, constructed in two parts or halves which, when placed face to face, inclose and form a cavity corresponding to the desired configuration of the article to be produced, there being no lining of sand requiring re-formation after every casting. In order to prevent the fracture of the casting, likely to be caused by the contraction of the metal whilst cooling in a rigid mould, the upper half of the mould is lifted off the moment the metal becomes solidified.

When casting tubes and hollow articles in cast-iron moulds, sand cores which yield to the pressure due to the contraction of the metal are used to form the internal bore or cavity, but in such cases it is not necessary to lift the upper half of the mould, as the contraction of the metal is convergent or a shrinking towards the centre, and therefore pressing upon the core, the peculiarity of this part of the process consisting in casting the molten metal between an outer surface of metal and an inner surface of sand.

[Printed, 4d. No Drawings.]



A.D. 1866, March 3.—N° 647.

DEAKIN, WILLIAM, and JOHNSON, JOHN BAGNALL.—(*Provisional protection not allowed.*)—The object of this invention, which relates to the manufacture of pipes, tubular and hollow cylinders, and other articles, is to combine strength with lightness of construction, and this is effected by the use of the homogeneous metal known as Bessemer's steel, worked or wrought by the processes and apparatus described in the specifications of former Letters Patent granted to James Thompson, viz., in the year 1863, Nos. 1023 and 1024, and in the year 1864, Nos. 139, 1018, and 2784. Also the processes described with regard to two applications for Letters Patent made by these inventors A.D. 1865, and dated respectively May 15, No. 1341, and October 30, No. 2795, the present invention consisting in taking the Bessemer steel in sufficient quantities or parts to form the article required, and working the metallic mass by the apparatus, appliances, and processes described in the said former patents, and also by other known processes and means for producing seamless tubes, cylinders, pipes and rods without weld.

[Printed, 4d. No Drawings.]

A.D. 1866, March 17.—N° 796.

BAKEWELL, FREDERICK COLLIER.—(*A communication from Joseph Sidney Seaman.*)—This is an invention of apparatus designed for rolling and straightening metallic tubes and cylindrical rods. The apparatus consists of a pair of rollers, horizontally disposed one over the other, their axes resting in suitable side frames are by suitable gearing caused to revolve both in the same direction, there being no contact of their surfaces. Around these rollers are formed wide concave grooves, the grooves of one roller coinciding and pairing with the grooves in the other. The tubes and rods to be operated upon are caused to pass obliquely between the rollers by means of guiding tubes, or troughs placed so aslant in relation to the axes of the rollers, that as the tubes or rods pass through the grooves, they are touched by one side and surface of the groove in one roller, and by the other side and surface of the groove on the other, and by this means whilst passing between the rollers they are made to revolve on their axes, which has the effect of imparting to the grain of the metal of the tube

or bar a twisted or spiral texture, whilst they are not only reduced and shaped, but they are also compressed and straightened at one and the same operation ; in form they are made truly cylindrical, and by reason of the grain of the metal taking a spiral direction, the tensile strength is increased.

The process which the inventor styles "twist rolling" is said to increase the strength of the metal generally and render it more compact, also that ingots of steel may be successfully welded by this process of rolling, and which it is stated the old process of rolling fails to accomplish.

[Printed, 8d. Drawing.]

A.D. 1866, March 27.—N° 901.

DEAKIN, WILLIAM, and JOHNSON, JOHN BAGNALL.—This invention relates to the manufacture of tubes, gun barrels, and other tubular articles, from cast tubular ingots or cylinders of steel, or Bessemer's or other homogeneous metal. These tubular ingots or cylinders are in the first place severally cast of sufficient length to make, when transversely cut up or divided, a number of short lengths each containing the requisite quantity of metal when elongated and diametrically reduced to form a tube or gun barrel, the invention more particularly referring to the early stages of the manufacture, consists in tilting, hammering, swaging, or rolling the cylinders in a heated state before they are divided, and also each separate piece afterwards in connection with a mandril to support the tube internally against the external pressure. It is stated that short tubular ingots produced in this manner, are more sound and perfect than when cast separately, and that the tilting, swaging, or hammering "operations will have the effect of solidifying and imparting to and (according to the extent of manipulation) improving the granular construction of the metal of the tube thus treated, and may be extended or regulated according to the purpose for which such reduced tubes may be required. We may find it necessary in some or any stage of production to force through the orifice a plunger or punch actuated by any convenient power, which has for its sole object the discovering of any defects in the metal under operation," such as "blow-holes" and defective ends.

[Printed, 6d. Drawing.]

A.D. 1866, April 9.—N° 1007.

FOSTER, JAMES, and HOLLINRAKE, JOHN.—The object of this invention, relating to the moulding process for casting metals, consists in making the moulds for pipes, pillars, rollers, and other articles of a similar cylindric character, more expeditiously and with less skilled labour than usual. To accomplish this the model pattern is placed in an opening made in a horizontal plate to correspond with its length and diametral size, the surface of the plate being just level with the plane of the axis of the pattern, so that exactly one-half of the pattern is above the surface of the plate, which has holes at its sides or corners to receive the steady pins of the moulding boxes, which are used in pairs or halves, each receiving one-half of the mould. The half boxes are placed by turns upon the plate over the pattern, precisely in the same position, and when the sand is introduced and rammed down upon and around the pattern, the latter, which rests upon supporting rollers below, is for the purpose of smoothing the mould, turned on its axis a portion of a revolution, until a longitudinal recess along the underside of the pattern comes coincident with the supporting rollers, which by entering the recess cause the pattern to sink, and leave contact with the sand. The first half box is then lifted off the plate, and another or second half is placed over the pattern, and the other half of the mould is formed therein. When these two half boxes are placed face to face they constitute a perfect mould; all the half boxes fit to each other and to the steady pins of the table, so that any one of them will pair with either or all the rest. When cores are required, they are placed in the lower half of the mould before the upper or inverted half is adjusted over it.

"When the pipes have flanges on the ends, the pattern is made with a flange at each end, a little above half a circle, and the pattern is turned half round; the flange will then have left the mould or nearly so, and will easily drop clear of the mould."

[Printed, 10s. Drawing.]

A.D. 1866, April 24.—N° 1157.

ABEL, CHARLES DENTON.—(*A communication from Anton Richter and Romuald Bozek.*)—(*Provisional protection only.*)—This invention relates to conjoining or connecting pipes, so as to produce flexible joints, water, steam, or gas tight. Several modi-



fications are described, consisting, first, of a flat broad ring or short tube of india-rubber or other elastic material, which, when the pressure on the pipes is external, is made to embrace and cover the meeting surfaces of two pipes when placed end to end together, but in cases where the pressure is internal, the ring or tube is placed inside, a part of its length being within the end of each pipe; the edges of the meeting surfaces of the pipes are chamfered either internally or externally according to pressure, and at the midlength of the flat ring or tube is formed either internally or externally as the case may be, an annular V-formed projection, which fits in the V-shaped groove formed by the chamfering when the meeting surfaces are in contact.

In making the joints of spigot and socket pipes having to bear "internal pressure, the spigot end is formed with an external rim a little way down, which fits into the socket, and a cupped india-rubber ring is placed over the spigot end so as to rest with its closed end against the said rim. When the spigot with such ring is put into the socket the fluid or gas under pressure is forced into the open end of the cupped ring and presses the sides thereof firmly against the surfaces of the socket and spigot." When intended for external pressure the arrangements are reversed. The other modifications also relate to socket pipes, and to the use of india-rubber rings or tubes in different forms and ways, to serve as packings between the meeting surfaces.

[Printed, 4d. No Drawings.]

A.D. 1866, May 11.—N<sup>o</sup> 1351.

AUSTIN, WILLIAM.—This invention, relating to a method of conjointing or connecting pipes, and to the packing employed, is supplementary to former Letters Patent granted to this inventor, and dated December 16, 1856, No. 2975. It has reference to pipes and tubes employed for the conveyance of water, gas, sewage, and other fluids, and has for its object the so forming the ends of such pipes and tubes, that the junctions may more easily be made and secured against leakage, and the pipes be laid and when required separated with more than ordinary facility. The pipes instead of sockets and spigots have abutting or meeting surfaces at their extreme ends, so that one or more pipes may be removed from a continuous line without disturbing those to which its or their ends were conjointed. The



ends of the pipes externally are annularly indented, corrugated, or grooved for the purpose of holding an annular ring or short packing tube, which embraces the ends of the pipes, one half of its length being on each pipe so as to cover the joint; this packing ring is forced into and imbedded in the corrugations on the ends of the pipes by the pressure of a conical collar, which when driven or forced on over the packing, compresses it and forms a secure joint. Examples of pipe ends conjoined, are described and illustrated, differing in the shape of the pipe ends and the collars, and also in the arrangement of the packing, which in all cases covers the joint.

The packing employed "may be of any suitable substance  
" which possesses elasticity such as vulcanized india-rubber, gutta  
" percha, preparations of both these substances, canvass or  
" woollen, or paper maché, or a combination of these substances  
" with india-rubber, gutta percha, or bituminous matter, either  
" cast in a mould to the desired form, or formed by successive  
" layers of thin sheets or strips of the material. In some cases  
" where the pipes are not required to sustain internal pressure,  
" wood, metal, or other non-elastic packings may be used, having  
" their inner surfaces which come into contact with the pipes,  
" smeared or payed over with tar, bitumen, white lead, or other  
" adhesive matter."

[Printed, *sd.* Drawing.]

A.D. 1866, May 25.—N° 1462.

GIBSON, WILLIAM, and ELLIS, EDWARD.—This invention has for its object by means of the machinery and apparatus employed, to simplify and reduce the number of operations hitherto practised in the manufacture of rods, bars, and tubes.

This machinery is described as consisting of a hollow cylinder and die, through which a cast steel or other metal tubular ingot in a heated state, is forced direct by the ram of an hydraulic press, which together with the cylinder is mounted on the same horizontal bed. One half portion of the length of the bore of the die cylinder is uniform in diameter, and thence the other portion tapers towards the end, which is thereby contracted and forms the die, which regulates the finished size of the tube or rod. The die cylinder is fixed concentrically within an outer cylinder, the space between them forming a channel for the flow of water, which prevents the heating of the dye cylinder to redness, the

water carrying off the heat. A pipe supplies water to the space between the cylinders, and another pipe carries off the steam. The guide which receives the heated tubular ingots is placed concentrically in front of the die cylinder, so that the end of the ram can act upon the ingot direct, and drive it through the guide into the cylinder.

"The ram is supplied with water in order to keep it cool from a cistern at its rear. When tubes are to be manufactured, a tube of the required size is passed through the tube which supplies the ram with water through the ram and die, which thus answers as a mandril, and leaving a space between the tube and die for that which is to be manufactured."

"For making cast steel tubes, we prefer having the steel cast into ingots of a suitable size for the apparatus, with a hole through it, and to place it into the apparatus as soon as it will bear lifting; the same with brass and copper; or the ingots may be cooled and reheated before being put into the apparatus."

[Printed, &c. Drawing.]

A.D. 1866, May 28.—N<sup>o</sup> 1482.

STUTTLE, HENRY. — (*Provisional protection only.*)—This invention relates to the construction of hydraulic presses adapted to the manufacture of pipes, bars, window and sheet lead, the object being to prevent the forcing off the head of the press cylinder, a casualty to which presses employed for such purposes are liable. To avoid this the bed plate of the machine is connected to the hydraulic cylinder by means of stay pins or bars of suitable strength, which hold the cylinder firmly in its place. "The ram employed for the purpose of supporting the die in the interior of the lead container is hollow and is furnished with internal brackets to support and give additional strength to the die through which the lead is forced . . . . If pipes, bars, or window lead are or is to be made, then dies constructed with any desired number of apertures of the requisite figure are used, the die being in each case supported in all those portions thereof which are not occupied by slots or apertures, by brackets in the interior of the hollow ram."

The lead container is connected to the ram of the hydraulic cylinder by means of pins secured to a flange attached to the

“ ram, such pins working in snugs or projections formed on the  
“ exterior of the lead container. The flange is provided with a  
“ stud in the centre thereof for covering the metal in the lead  
“ container when the ram carrying the flange is forced towards  
“ the die. The effect of this arrangement is that when the ram  
“ has forced the metal through the die and is again raised the  
“ lead container is also raised with it, the space between the  
“ flange and the top of the lead container being regulated by  
“ the length of the before-mentioned pins. The lead container  
“ having been thus raised is ready to receive a fresh charge of  
“ lead in the ordinary manner, the space between the lead con-  
“ tainer and the flange being sufficient to allow for feeding and  
“ skimming off dross.”

[Printed, 4d. No Drawings.]

A.D. 1866, June 16.—N° 1636.

MUNTZ, GEORGE HENRI MARC.—This invention relates to the manufacture of joints and connections, such as tees, crosses, and manifold way unions, adapted to the conveyance and distribution of gas, steam, water, and other fluids. The inventor says:—“In carrying out my invention I take a plate of wrought iron and punch a hole through the centre; I then take a bar rolled to a proper section, and bevilled on one edge, and form this into a short socket, and scarf weld in the usual way; this socket is inserted into the plate, and almost through the centre hole, the bevilled edge of the socket being by preference on the inside; I then place both plate and socket in a suitably formed concave bottom die, and I employ a top die, convex in form, and provided with a tapered plug, by which the bevilled edges of the socket are bent down and welded, whilst the plate is at the same time bevilled on its meeting edges, and dished or turned up into a form of section, which will, when the edges are subsequently brought together and welded, form a complete circle, with the edges scarfed and lap-welded; this constitutes a three way or tee joint. In making a four-way or cross joint, I proceed in precisely the same way as that last described, but my plate will be shorter, to form one half the barrel of the tee joint only, and putting two of these parts together and welding them forms the cross or four-way joint; or by another mode I punch two holes in a longer plate, and insert two sockets in



“ them, then bending the plate round in the direction of its  
“ length, and welding the meeting edges forms the four-way  
“ joint. In making joints with more than four ways, I proceed  
“ in similar manner, but employing longer plates to receive a  
“ greater number of sockets, so that when the plate is bent round,  
“ each socket forms a radiating arm from the common centre  
“ formed by the plate. I can also form this description of joint  
“ by using more than one plate if preferred, as it may be con-  
“ venient to use two or more, each containing its required number  
“ of sockets, to form when combined the description of joint re-  
“ quired. I also propose to form these joints by raising the  
“ sockets out of the solid plate of metal, by means of dies and  
“ punches under force or pressure, and so to avoid welding the  
“ sockets into the plates.”

[Printed, 4d. No Drawings.]

A.D. 1866, June 26.—N° 1698.

COTTERILL, CHARLES FORSTER.—(*Provisional protection only*).—This invention relates to the construction of such pipes as are built up or formed by combining together segmental sections of earthenware and other materials, and thereby forming what may be termed double pipes, or two pipes one within the other. The segmental pieces according to the present invention are made thinner than usual, and the space formed between the two pipes so constructed is filled up with cement. Projecting transverse ribs are formed externally on the segments of the inner pipe, for the purpose of preserving a uniform intermediate space between the two pipes, and the segmental pieces are so disposed relatively as to break joint. The composition or cement consists of 6 parts by weight of pitch, 1 part by weight of gas tar, 1 part by weight of plaster of Paris, and 10 parts by weight of sand, heated and mixed together. When taken from the kiln the segments are, whilst in a heated state, dipped in a composition compounded of the above ingredients in different proportions. The composition fills all the cracks or fissures in the segments, and to it the cement when introduced in a melted state readily adheres.

Pipes of metal and other material may be constructed and treated in the same manner.



Describes a portable furnace and pan divided into two compartments, to be employed respectively for the purpose of melting the cement in one, and the composition in the other.

[Printed, 4d. No Drawings.]

A.D. 1866, July 4.—No 1776.

BROTHERTON, JOHN.—This invention relates to machinery devised for shaping and lap-welding tees, crosses, elbows, sockets, and other tubular junctions in connection with pipes adapted to the conveyance and distribution of gas, steam, and water; also the barrels of wrought-iron cocks. "The machine consists of a  
" bed, upon which is mounted a number of carriages, one or more  
" of which may be brought into action, according to the number  
" of arms or ways required in the finished fitting; each of these  
" carriages supports at one time a shaping tool, at another a  
" mandril, to suit the description of work the machine is required  
" to perform at the time, and each carriage is governed by an  
" eccentric driven by mitre wheels upon the same shaft, so that  
" all the tools or mandrils, as the case may be, may be carried  
" simultaneously to the centre of the machine, at which point is  
" fixed a block to receive the swage tools."

In making a tubular cross, the first operation is to shape the two halves or parts required to form it, " and for this purpose a plate  
" of iron cut and shaped to the proper form, and bevilled on the  
" edges if required, is placed upon a concave die in the anvil  
" block, and a top tool or convex die worked by stamp hammer,  
" hydraulic press, or oliver is brought down to dish or sink it  
" into a semi-cylindrical section. Two similar parts, but one  
" rather larger than the other, having been thus stamped or forged,  
" the top tool or convex die is removed, and a counterpart of the  
" bottom one or concave die is substituted, and two of these sunk  
" plates are then put together and heated, and are laid into the  
" concave die upon the anvil block; the four mandrils are ad-  
" vanced instantly towards the centre, and lie in the four arms  
" of the sunk plates; the hammer stamp, press, or oliver is brought  
" into action, and perfectly welds the parts. Bending and welding  
" are thus both done by one machine with exchange of tools, but  
" the machine having been set for bending, a sufficient number  
" of parts are first struck off before the machine is re-arranged  
" for welding."

[Printed, 10d. Drawing.]

M.P.

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A.D. 1866, July 13.—No 1468.

**PLANT, GEORGE.**—This is an invention of apparatus employed in the manufacture of taper, conical, or other form of welded wrought-iron and steel tubes, with flanges similar to those described as applicable to steam boilers in the specification of W. and J. Galloway's patent, dated March 11, 1851, No. 13,552, the apparatus being also applicable to the manufacture of tubes otherwise formed. It consists of a horizontal over-hanging mandril carried by a suitable framing or carriage which moves upon wheels. After the skelp has been bent to the required form and heated for welding, it is placed on the mandril, and the travelling frame is brought into position beneath a steam hammer, which operates gradually along the seam, the frame moving a sufficient distance after each successive blow to ensure a sound welding of the seam from end to end.

The apparatus whereby flanges are formed on the ends of tapering and other tubes consists of a die in which, after previous heating, the tube is placed, its end projecting a distance through the die according to the breadth of flange required; the tube end is opened out by means of tapering plugs or wedges, which are placed in the tube end and brought beneath the blows of a steam hammer, or the ram of an hydraulic press, the blows or pressure respectively as the case may be, by driving in the plugs or wedges, cause the expansion of the end of the tube, which is subsequently flattened down by swages under the same hammer. When the flanges are required to fit to a cylindrical surface, the face of the die is shaped to a corresponding curvature.

In order to finish a flanged tube to the exact length required, the lower end for the time being whilst the flanges are being formed is made to rest upon an adjustable base, capable of being moved upwards by an hydraulic ram or other suitable mechanism, and having by means of set screws or otherwise facilities for shifting the tube into the necessary position for forming the flange on its end when required to be set oblique to its axis.

[Printed, 1s. 4d. Drawings.]

A.D. 1866, July 21.—No 1903.

**MITCHELL, ROBERT.**—This invention of machinery, designed for forging and shaping metals, is supplementary to a prior

invention, for which the inventor says, "letters patent were granted to James Alfred Shepton and myself on the 19th of January 1865, No. 165," the machinery described in the present invention being adapted to facilitate the process of finishing the partly forged tees, elbows, bends, crosses, couplings, and other pipe fittings, produced by the steam machinery mentioned in the specification of the said former patent. To this end, in addition to the former forging and shaping apparatus it is proposed to employ for welding or finishing the partly forged articles, a pair of clams, swages, or moulding jaws, which by closing upon the article placed between them, impart to it the required form and finish, a pair of converging dies being employed in combination with and so as to operate between the jaws, which may be actuated by any convenient means, either in connection with the steam cylinder of the machine, or by other suitable mechanical contrivance.

The other part of the invention relates to an arrangement in connection with the steam cylinder of these steam forging, bending, welding, and shaping machines, for cushioning the piston at the top of its stroke, by cutting off and confining a portion of the exhaust steam or other fluid employed to work the machines above the piston, and thereby prevent the contact and consequent striking of the piston against the inside of the cylinder cover, when at the end of the up stroke.

[Printed, 1s. Drawing.]

A.D. 1866, August 3.—N<sup>o</sup> 2006.

DEAKIN, WILLIAM, and JOHNSON, JOHN BAGNALL.—  
(*Provisional protection not allowed*).—This invention relates to apparatus adapted to the manufacture of tubes, hollow cylinders, axles, and other tubular bodies, combining lightness and strength, and is devised as a supplementary improvement on a prior invention in respect of which Letters Patent dated April 22, No. 1018, were granted to James Thompson. It consists in the use for this purpose of "the homogeneous metal known as Bessemer's steel, and the taking of such metal in sufficient quantities or parts, according to the purpose for which it may be desired, and drilling and punching, piercing or perforating, and treating the said mass by the processes, means, and appliances as described in Patents granted to us, Nos. 1341 and 2795,

“ both of 1865 (as being for the manufacture of gun barrels and ordnance), to reduce it to the shape and dimensions required, whether regular or irregular, together with the formation of flanges, bearings, journals, or projections, so that a tube, cylinder, or hollow cylindrical body or part may be formed and fashioned to any given shape according to the purpose desired in one entire seamless piece without weld of any kind.”

[Printed, 4d. No Drawings.]

A.D. 1866, August 6.—N° 2023.

MEDCALF, RALPH, and NICHOLLS, WILLIAM.—(*Provisional protection only.*)—This invention, relating to a method of coupling or connecting pipes adapted to the conveyance of water, gas, and other fluids, consists mainly in the use of two or other convenient number of spring clips, which are hinged to lugs cast upon one of the pipes.

“ The tails of these clips are acted upon by springs which tend to force inwards catches on the other ends of the clips; these catches are situated a slight distance beyond the end of the pipe; upon this pipe we also cast a flange to form a seat for a ring of india-rubber or other suitable elastic material which we fit round the pipe. The flange and ring are, say, about an inch more or less from the end of the pipe, which is slightly conical or tapered from the flange to the end. The end of the other pipe or portion to be coupled or connected to the first pipe has cast upon it a ring tapered or conical externally, and by preference cylindrical internally.”

When connecting two pipes “ the tapered ring is forced over the tapered portion of the other pipe, and the catches of the spring clips are thereby pushed outwards until the tapered ring has passed them; as soon as the ring has passed them the catches are again forced in by the action of their springs and take behind the ring so as to hold or couple the pipes together. The end or rim of the ring on the second pipe presses upon the india-rubber ring and thereby prevents all the escape of the gas or other fluid. In some cases as for hose pipes where the tails of the clips are liable to come in contact with irregularities of the ground, we cast upon the pipe loops or other convenient guards, which pass over and thereby protect the tails of the clips.”

[Printed, 4d. No Drawings.]



A.D. 1866, August 8.—N° 2039.

HOLLAND, HENRY.—This invention relates to the manufacture of ferrules and tubes used for umbrellas and parasols. Ferrules according to the ordinary mode of manufacture are raised from sheet metal by raising tools in a press, but instead of as usual cutting the bottom or closed end out and soldering in its place one of greater strength, this part of the invention consists in rivetting a cupped circular piece or disc of iron or other metal externally to the end of the ferrule, which is allowed to remain, so that the end or bottom of the ferrule is composed of two thicknesses of metal.

The tubes which answer for the sticks of umbrellas and parasols, have been made by bending laterally and drawing the narrow sheet of metal into a tubular form, the edges of the seam being soldered together. The invention dispenses with the soldering process, and instead thereof, turns up the longitudinal edges of the metal band intended to form the tube, each edge to a right angle with the plate, and when the latter is bent into the trough form and by a subsequent operation by means of suitably grooved press tools, the turned up edges are brought together face to face. These are then rivetted together, and a tube is formed having laterally projecting along one side throughout its whole length a straight longitudinal flange or rib. Such tubes (it is stated) are suitable for use in the manufacture of umbrellas and parasols.

[Printed, 6d. Drawing.]

A.D. 1866, August 10.—N° 2059.

COTTERILL, CHARLES FORSTER.—This invention relating to the manufacture of earthenware and other pipes, relates mainly to double pipes, that is, pipes built up or composed of segmental pieces bound together by metallic straps, and so arranged as to constitute two pipes, one within the other. These pipes are generally made of earthenware, and used chiefly for conveying water and sewage; they may also be made of metal or other material, and the main feature of the invention consists in filling up with a cement liquefiable by heat, all the end spaces and annular interstices between the segments, so as to form them collectively into one solid tubular pipe. On the segments which compose the

after the wet sheet preparation and when built up in combination with the ingredients which constitute the paper pulp, they are subjected successively to several processes, such as the pressing of the paper pulp between by the moist parts of the surfaces of the paper pulp, and the rest. These successive operations, in sequence, a paper made of paper or other substance paper having the spaces between them filled up with cement, may be employed. The cement is composed of paper turned in a round shape with a due proportion of water.

The machine now includes the part of a machine possible to be made movable in water, and a vessel wherein to soak the cement, in which the ingredients when taken from the bin are placed in a vessel such as a bucket, for the purpose of filling up the spaces and between. This part of the process may also be applied to metal paper.

[Printed, &c. Drawings.]

A.D. 1866, August 10.—No 3961.

**REXNELL, GEORGE WIGHTWICK.** — *Provisional protection only.*—This invention, relating to the manufacture of coiled iron tubes or cylinders adapted to the construction of cannon, consists in the employment of rollers for the purpose of reducing or bringing the coiled tube or cylinder to the exact diameter and thickness required, the operation being similar to the process practised in the rolling of wheel tyres; the power communicated direct to the rollers, may be either steam or hydraulic. The process (it is stated) improves the quality of the metal, and the waste incident to the ordinary mode of manufacture is avoided. The inventor says "I first weld the coiled bar into a continuous cylinder under a steam hammer or by any other process now in use, after which it is to be transferred in a heated state to the rolling apparatus. This apparatus consists of two main rollers in connection with one or more guide rollers. The coil is put over one of these main rollers, one or both of the bearings of which are temporarily withdrawn to allow of this being done. The rollers are so arranged that they may be gradually approached to each other so as to roll out the sides of the cylinder, the circular form being maintained by the guide roller or rollers."

[Printed, &c. Drawings.]

A.D. 1866, August 25.—N° 2188.

LITTLE, GEORGE.—This is an invention of apparatus designed for the manufacture of tin and other metal drums and tubes suitable for use in machines employed in the preparation of cotton, and other fibrous materials, and for other purposes; conical tubes may also be produced.

The general feature of the invention consists in soldering or otherwise joining the seams or edges of the sheet metal, whilst they are held in a true cylindric form by a cylinder or other casing, and in some cases by an internal expanding mandril. The tin drums employed in cotton machinery are generally of considerable length made out of a number of short tubes joined end to end together and soldered, and another feature of the invention consists in swaging by a rolling process the ends of the short tubes made as above, so as to form their ends for lapping together, and then soldering them round the junction whilst in the apparatus. By this means drums and tubes may be made of any desired length, and true both cylindrically and lengthwise. "The metal " is in the first instance bent round by the usual means: it is " then placed upon a mandril and is drawn into a cylinder, and " the said mandril by expanding forces it into the required form. " The cylinder is provided with a slit corresponding in situation " to the joint to be made, and along this the workman passes his " soldering iron. The joined metal being now removed constitutes " one length to be attached to others to form the whole length of " drum; this length is placed in another cylinder, and a roller " capable of being pressed on to its internal surface rolls the " metal and at the same time swages the ends for making the " joint with another length, for which purpose two lengths are " made as above described, and kept true to each other by the " cylinders holding them, and having been brought together end " to end, they are caused to revolve, the workman at the same " time holding his soldering iron upon the joint, and these " operations are repeated until the entire drum is made."

[Printed, 1s. 10d. Drawings.]

A.D. 1866, August 31.—N° 2244.

ABEL, CHARLES DENTON.—(*A communication from Anton Richter and Romuald Bozek.*)—This invention relates to the use of india-rubber rings and washers, which are interposed between

the meeting surfaces of the ends of pipes when connecting them together, thereby producing a flexible air or fluid tight joint. Several examples of these joints are described and illustrated, the transverse configuration of the rings being adapted to the formation of the pipe ends, whether butt, socket, or other joint.

"In forming a butt joint between two pipes having to withstand internal pressure, the ends of the pipes are recessed on their internal surfaces for a short distance, and into such two contiguous recessed ends is placed a correspondingly formed short tube of india-rubber, which, when the pressure is exerted inside the pipes, is forced against the surfaces of the recesses, and thus closes the joint the more effectually the greater the pressure is.

"In order to make a still more perfect joint, the inner meeting edges of the pipes may be chamfered off, so as when placed together to form a circular V-groove, and a correspondingly formed V-projection on the outer surface of the india-rubber tube is then made to fit into such groove. For suction pipes where the pressure is external a similar joint may be employed, the V-groove being formed by the outer chamfered edges of the pipe, while the V-projection is formed on the inner surface of the india-rubber tube, which in this case is placed over the exterior of the joint."

"In another arrangement, where it is required to form the joints of socket and spigot pipes under internal pressure, the spigot end is formed with an external rim a little way down, which fits into the socket, and a cupped india-rubber ring is placed over the spigot end, so as to rest with its closed end against the said rim. When the spigot with such ring is put into the socket, the fluid or gas under pressure is forced into the open end of the cupped ring, and presses the sides thereof firmly against the surfaces of the socket and spigot." When this arrangement is applied to pipes under external pressure, the position of the cupped ring is reversed.

[Printed, 10d. Drawing.]

A.D. 1866, September 10.—N° 2319.

NEWTON, ALFRED VINCENT.—(*A communication from William Forman Brooks.*)—(*Provisional protection only.*)—This invention relates to the manufacture of seamless metallic tubes from cast tubular ingots, wherein are fitted or cast mandrils or cores com-



posed of metal more readily fusible at a lower temperature than the cast metal of the ingots, which are then severally rolled or drawn out to the desired thickness or diameter and length respectively of the intended tubes. In this state, for the purpose of heating the tubes, they are placed in an inclined position in a reverberatory furnace, with their lower ends over a receiver, into which so soon as the heat is sufficient to melt the cores, the liquid metal will run. The tubes that are left may then be taken from the furnace, and if requisite dressed and finished by any of the well known processes.

In some cases, as for instance, where small tubes are manufactured, it may be desirable instead of filling the ingot with the solid fusible metal, to use a suitable metallic oxide or material that calcines in the process of the manufacture. The core may be composed of red oxide of copper, and instead of after the rolling process placing the compound rod in the furnace, it may be placed in a sulphuric acid bath, which will remove the core and leave a comparatively clean tube.

[Printed, 4d. No Drawings.]

A.D. 1866, September 18.—No 2395.

PARKES, THOMAS.—This invention relates to tube cutters which are constructed with three rotating tools or cutters, that act simultaneously upon the tube, two being supported by the claw, and the third by one arm or lever, which is jointed to the body of the cutter after the manner of jointing pliers, and is pressed towards the claw by a screw, the claw being on one side of the body instead of at its end. "The tube or rod to be cut is placed in the claw upon the edges of the two rotary cutters carried by the said claw. By means of the screw described, the third cutter carried by the arm or lever is pressed against the tube or rod with the required degree of force. On turning the cutter around the fixed tube or rod, the three cutters act simultaneously on the said tube or rod, and by maintaining the required degree of pressure of the cutters on the rod or tube by means of the screw, the tube or rod is rapidly cut through. A supplementary chisel-ended cutter may be fixed in the arm or lever carrying the third cutter for the purpose of cutting or shaving off the burr formed by the action of the rotary cutters."

[Printed, 8d. Drawing.]

A.D. 1866, October 4.—N° 2552.

**WOLSTENHOLME, JOHN and PENDLEBURY, THOMAS.**—(*Provisional protection only.*)—This invention relates to tube and bar cutters adapted to shave the external surface of a tube or a bar instead of filing them, preparatory to cutting screw threads thereon; and also in a modified form applicable for severing tubes or bars transversely.

It consists "chiefly in making the centre portion of a wrench  
" with two projecting parts, into one of which is placed two  
" rollers or a recess to receive the tube or bar of metal to be cut;  
" on the other side of the same projecting part is fixed a handle  
" forming one handle of the wrench. On the middle bar from  
" which the two said projecting parts proceed is placed a sliding  
" block acted upon by another handle screwed through the other  
" projecting part; the last-named handle will by being turned  
" by the hand or other appliance cause the before-named block to  
" advance to or recede from the two rollers before named as may  
" be required. The said sliding block carries a tool box having  
" a cutting tool movable in a slot and set fast or loosened by a  
" set screw. The said tool box has a projecting part in front of  
" the cutting edge of the cutting tool, also another projecting  
" part which fits into a groove or slot situate in the before-named  
" sliding block, and is movable on a pin passed through the  
" same."

To reduce the diameter of a tube or bar, it is placed against the two rollers or recess, and the cutting tool is brought to bear against the opposite side; the projecting part of the tool box in front of the cutting edge of the tool is also by means of the handle pressed against the bar or tube, round which when the wrench is turned, the cutter operates and reduces the diameter.

When tubes or bars are to be severed, the pin which holds the tool box is to be withdrawn, and the latter is replaced by a circular cutter.

[Printed, 4d. No Drawing.]

A.D. 1866, October 23.—N° 2734.

**HOLLINGDRAKE, ROBERT.**—This invention relates to the manufacture of pipes or tubes adapted to the heating of rooms with steam, hot air, or water, and also available for extinguishing fires which happen to occur in the rooms wherein the pipes are dis-

posed. The bore of these pipes is made with a longitudinal partition or mid-feather, by which the interior of the pipe is equally divided diametrically throughout its whole length into two semi-circular halves, which have no connection. The upper half of the bore serves for the passage in which the heating medium (steam, water, or air), circulates, and the lower half is perforated, and remains empty although connected to, and capable of being put into communication with the steam chest of the boiler, by suitable valves in case of fire. It then serves to conduct the steam into the room or apartment where the fire is in progress, and by escaping through the perforations, it damps and extinguishes it. Instead of employing the lower half of the bore for steam as occasion may require, it may form either the return passage for hot water circulation or for the water of condensed steam, the perforations in such case being dispensed with. Although the heating medium in such pipes has a more contracted passage through which to flow, the amount of heating surface is not reduced.

[Printed, 6d. Drawing.]

A.D. 1866, October 26.—N<sup>o</sup> 2762.

MUNTZ, PHILIP ALBERT.—(*Provisional protection only.*)—This invention relating to the manufacture of metal tubes, is principally applicable to such tubes as are made of alloys of copper and zinc. These tubes are made from tubular ingots, which are to be cast and then flattened by rolling in the ordinary way. The next stage in the process, according to the invention, consists in passing the flattened tube direct through rollers with semi-circular grooves, the tube being opened by a fixed mandril during the operation, and by this means the flattened tube is at once made cylindrical. The flattened tube may, however be partially opened by first passing it through a pair of rollers with semi-elliptical grooves, although the use only of the semi-circular grooved rollers is preferred, the object being to effect the opening of the tube without the formation of longitudinal fins or feathers. The tube may as required be annealed from time to time at intervals during the process, “but the whole of the rolling processes are to be conducted “whilst the tube is in a cold state.”

[Printed, 4d. No Drawings.]

A.D. 1866, November 2.—N<sup>o</sup> 2840.

CHATWIN, THOMAS.—(*Provisional protection only.*)—The object of this invention relating to the screwing and cutting dies of screw

stocks and tube cutters, is by a simple contrivance to cause either their simultaneous advance or divergence. The screwing dies and cutters are fitted to slide in radial slots made in the ordinary way in the body of the stock. Formed on the upper side of each die or cutter, is a series of curved teeth or notches, which engage with the convolutions of a spiral thread, formed on the under side of an annular plate, that is fitted over the dies concentric with the centre of the stock, and has liberty to be moved round the centre when required by means of a knob. By this means when the plate is rotated, the dies or cutters are caused to move radially to or from the centre according to the direction of motion, either to increase the cutting action of the dies and cutters or to withdraw them.

[Printed, 4d. No Drawings.]

A.D. 1866, November 10.—No 2940.

KORSHUNOFF, NICHOLAS.—This invention, relating to the manufacture of malleable iron and steel, consists in introducing by means of suitable pipes and a tubular puddling tool, the vapour of nitric, chloric, or of other acid rich in oxygen, and also the vapour of hydro-acids or other materials rich in hydrogen, alone or combined with an air-blast; hydro-carbon in a state of vapour may also be introduced.

Cast iron of superior quality is made from scrap iron or steel, which is placed in a suitable furnace with charcoal or coke, either alone or mixed with anthracite coal, in separate layers or strata alternately of the scrap metal and fuel respectively. The furnace is urged by a high-pressure air blast, and by this means (it is stated) the scrap metal is melted down and carbonized into a very pure quality of cast iron suitable for the manufacture of steel.

The tubular puddler, made with either one or two arms, is attached to the lower end of a hollow shaft disposed vertically above the furnace, and made capable of rotation by means of bevel gearing, either in connection with the motive power, or capable of being rotated by hand, the service pipe which conveys the gases being in communication with the reservoirs or vessels wherein they are generated.

The manner of constructing the furnaces, the mode of arranging the tuyeres and other appliances, and the method of working are also described.

[Printed, 2s. Drawings.]



A.D. 1866, November 14.—N° 2983.

TRUSS, THOMAS SEAVILLE.—This invention relating to a mode of connecting the ends of pipes together so as to form flexible joints, consists in making “a circular or conical-formed groove round the outer surfaces of the pipes at or adjoining their ends, and in the construction of a band to embrace the ends of the pipes when they are brought together to be jointed or connected. The band is constructed of one piece or in several parts or segments, the several ends of the same forming ears or projections for screw bolts to pass through in order to secure together the ends or several segments or parts into which the band is divided. The interior of the band is constructed with two raised circular or conical-formed beads or projections on the internal circumference at or adjoining the outer edges, which beads or projections fit into the grooves round the ends of the pipes. Between the surfaces of the grooves on the ends of the ends of the pipes and the beads or projections in the interior of the band india-rubber or any other material suitable for making gas, water, steam, and air-tight joints is applied; then by drawing the ends of the band or the several parts or segments together by the screw bolts passing through the ears or projections formed at their several ends, the required pressure is applied upon the joint-making material to make a gas, water, steam, or air-tight joint, which joint when made is a flexible joint allowing of the oscillation of the pipes without impairing the tightness of the joint.”

In some cases instead of one, two grooves are made round each pipe end.

[Printed, 8d. Drawing.]

A.D. 1866, November 14.—N° 2985.

HUGHES, HESKETH.—This invention relates to the ornamentation of tubes with designs partly raised above the original surface of the tube, and partly depressed below it. For raising the parts of the design upon the tube, an expanding mandril is employed inside. This mandril carries tools or rollers which act by lateral pressure against the inside of the tube, so as to force the metal of the tube (where the pressure is exerted) outwards, thereby causing an annular enlargement corresponding to the form of the pressing tool or roller carried by the mandril, and on such enlargement

externally a design is engraved or depressed by a revolving die, which presses externally coincident with the part where the metal is supported by the mandril tools or rollers, the tube during the operation being caused to rotate. Dies linked together in the form of endless chains are also employed to make annular depressions, the two chains of dies acting simultaneously on the tube, one chain at each side opposite the other. Roller dies capable of opening and closing upon the tube externally are also employed.

[Printed, 10d. Drawing.]

A.D. 1866, November 20.—N° 3047.

BROOMAN, CLINTON EDGCUMBE. — (*A communication from Mayeul Bernabé.*)—The object of this invention consists by means of a method or process based on electro-metallurgy, of covering or coating tubular articles such as printer's rollers and boiler tubes, and also other articles of iron and steel, with copper or copper alloys, such as brass or bronze, is to make such tubes and articles available for use where formerly solid copper was employed. The process comprises three operations.

1st. Cleaning or scouring the articles by immersion in a dilute bath for six hours, of water and sulphuric acid at 2° Beaumé, which is afterwards washed off with water; then rub with sand and water slightly alkaline, and finally wash in fresh water.

2nd. "The cleaned or scoured articles are placed in a bath made alkaline by cyanide of potassium. The vessel containing the bath is, by preference, stoneware. In the interior is a plate of copper or copper alloy facing, and of the same dimension as the iron or steel article to be coated or covered. The two conducting wires of a galvanic pile are placed one in connection with the copper or alloy and the other with the iron or steel article, and an electric current is thereby established which causes a deposit of copper or copper alloy upon the iron or steel article; in a few hours the layer deposited is sufficiently thick to insulate or separate the iron."

3rd. "Strengthening or increasing the first layer of copper or alloy which covers the iron or steel article by submitting the article to a second galvanic coppering. For this purpose the article already coated with copper or copper alloy is immersed in an acid bath of sulphate of copper, a plate of copper or copper alloy of the same dimensions being placed opposite the iron or steel article. The bath is contained in a wooden vessel, and is

"also traversed by an electric current from a pile. The iron or steel articles should be left in this bath for from one to two days or more, according to the thickness of coating or covering required."

[Printed, 4d. No Drawing.]

A.D. 1866, November 26.—N° 3105.

THOMSON, WILLIAM RICHARD MIDDLEMORE.—(*Partly a communication from Nicholas Thomas and Thomas Somerville.*)—

This invention relates to a variety of apparatus and machines devised for dividing or cutting tubes, also the ends off tubes when fixed in tube plates and otherwise, and for other analogous purposes. The modes in which the several cutter apparatus are made to operate, either from the inside cutting through to the exterior, or for cutting inwards through the external surfaces, are manifold. Both circular and rigid cutters are employed, and a variety of contrivances are devised for fixing, steadying, and supporting the cutting apparatus during the time required for the operation, which may be effected either by hand or motive power. When cutting tubes through from the inside, the cutters, which are carried by spindles variously contrived, are by the action of the apparatus pushed outwards laterally by a feed motion combining a wedge and screw action, and the cutting of tubes through from the exterior, is effected by means of hollow spindles, collars, or cutter holders, that are caused to revolve round the tubes, and carry the cutters, which are made mechanically to gradually close or approach the axis of the tube, either by the action of the apparatus or otherwise.

[Printed, 1s. 4d. Drawings.]

A.D. 1866, November 28.—N° 3136.

FARGON, LOUIS ALEXANDRE.—This invention relates to a method of conjoining metallic pipes and tubes, whereby it is stated they may be connected together with great simplicity and economy. The general principle consists in lapping a soft metallic or leaden packing round the meeting ends of the pipes, and forcing this packing into intimate contact with the surface of the pipes by means of a screw clip or hinged collar, the pipe ends externally and the packing internally having annular grooves and ribs which respectively bed the ribs on the pipes into the grooves

in the packing, and vice versa, when the hinged collar or clip is temporarily closed round them by a screw. This collar is afterwards removed and a hoop of wrought iron, slightly conical internally, is driven on over the lead. Instead of using the lead alone, india-rubber may be employed in conjunction therewith; the lead packing may be made conical to correspond with the collar and hoop, and the annular grooves and ribs on the pipe ends and inside the packing, may, as described and shown by the drawings, be fashioned in a variety of ways.

[Printed, 10d. Drawing.]

A.D. 1866, December 4.—N° 3181.

HORTON, JOSHUA. — (*Provisional protection only.*)—This invention relates to the construction of metal pipes, which are to be cast hollow without the use of cores. It consists “in the  
“ application of the principal of centrifugal force in the formation  
“ or productions of tubular articles, for example, a mould of the  
“ exterior form of the article required is prepared and placed  
“ between two centres horizontally, or so otherwise situated that  
“ it may be caused to revolve on its axis rapidly. The molten  
“ metal is introduced into the mould and the whole is caused to  
“ revolve rapidly, which causes the metal to be projected from  
“ the centre of revolution into the various forms and parts of the  
“ mould, which become filled with metal, and a hollow tube is  
“ made within the metal, the axis of which corresponds with the  
“ axis of revolution, the outer surface corresponding with the  
“ shape of the mould. When the metal is cold it can be removed by opening the mould box.”

[Printed, 4d. No Drawings.]

A.D. 1866, December 19.—N° 3336.

HENRY, MICHAEL. — (*A communication from Louis Coignard.*)—This invention relates primarily to the construction of centrifugal pumps, and incidentally to the use of wrought-iron flanges for forming the connections with cast-iron pipes.

These centrifugal pumps, consisting mainly of two parts, comprising a revolving wheel divided helically by convolute spiral vanes, and a stationary casing surrounding it, and the general arrangements and constructional details, will be found more



particularly described in the volume of Abridgments especially devoted to that subject.

With respect to the wrought-iron movable flanges for the pipes and tubular connections, it is stated they are "especially useful when applied to the pipes fitted to these pumps, as it allows of their turning readily and being properly flexible. The movable flanges are made of wrought iron, and they are made and put into position before the pumps are cast. The same arrangement may be adopted for the cast metal elbow pipes or bends for other pipes, especially for the flexible pipes used for drainage purposes."

[Printed, 1s. 6d. Drawings.]

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## APPENDIX.

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A.D. 1741, September 9.—N<sup>o</sup> 579.

CREED, JAMES.—This invention relates, first, to the construction of apparatus designed for cutting sheet lead into strips or ribbons of the different breadths required for forming leaden pipes of various sizes, and to the manufacture of such pipes; second, covering the roofs of buildings with such strips or narrow sheets of lead, and strips of copper or brass; and third, to the construction of a force pump, adapted to act either as a common pump, or to raise water to any usual height, and by the aid of an air vessel produce a continuous flow and act as a fire engine.

Three modifications of apparatus, adapted to the cutting of sheet lead into narrow parallel widths or strips for forming lead pipes and for other purposes, are described. The process is effected either by straight knives or cutters fixed by screws or otherwise a suitable distance apart according to the required circumference of the pipe, in wooden or metal holders or pieces, or the sheet metal is incised by circular cutters disposed apart upon an axis of wood or of iron, and mounted to rotate in suitable bearings. The sheets of lead are either caused, by the aid of the rollers of a lead mill, to move under the cutters, or (it is stated) the process "may be performed by drawing such knives

M.P.

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"and cutters through the sheets of lead opened out on a platform for that purpose."

The leaden strips are brought into a tubular form by first passing them separately between two rollers, either of wood or metal, one roller having formed around it grooves of suitable shape and size, and the other roller corresponding projecting ridges, which fit into the grooves and press the leaden strip therein, when the rollers are set in motion, and the metal strip is passed between them. This part of the process bends the strips into a trough-like form, and they are afterwards passed between another pair of rollers, each of which is furnished with semicircular grooves, forming, when the two rollers are together, circular openings corresponding to the required external diameter of the finished pipes, the circular configuration of the bore or internal diameter being shaped by a ball, which, whilst the rollers rotate, is held in a fixed position in the opening directly between them inside the pipe under process, the edges of the strip, which are brought together to form the seam, being at the same time scraped fit for soldering by a tool attached to the frame which holds the ball.

Strong pipes are made from thicker strips turned up by hollow semicircular moulds, which are forcibly pressed together on cylindrical cores, the edges being scraped and then soldered.

These pipes when used in buildings and otherwise may be protected and supported by embedding them between two pieces of timber, screwed or clamped together.

[Printed, 4d. No Drawings.]

A.D. 1797, October 31.—N° 2196.

BRAMAH, JOSEPH.—This invention relates primarily to the arrangement, construction, and general combination, of apparatus designed for the purpose of "retaining, clarifying, preserving and "drawing off," malt and other liquors, wines, and beverages; comprising 1st, store and service casks; 2nd, force pump and appurtenances; 3rd, filtering apparatus; 4th, a self-acting vent peg; 5th, the soft metallic pipes employed and the method of making them; 6th, stop-cocks and appliances; and 7th, the combined arrangement of the whole apparatus.

The 5th part of the invention relating to the manufacture of soft metal pipes, consists of a machine or apparatus whereby such pipes may be made in a continuous length without joints, and to

any required size. This process is effected by pressure, which forces the metal in a molten state from a melting pot or chamber, out through an annular die or mould, laterally fixed projecting from the pot near to its base. Fixed in a vertical position in the center of the chamber is a pump barrel, wherein is nicely fitted a solid plunger, which is caused to move up and down by a lever handle above. Close to the lower end of the pump barrel, at one side, is fitted a valve which opens into the barrel from the melting pot, and directly opposite, projecting from the other side of the barrel, there is a tubular passage that forms a communication between the pump barrel and the die or mould, the internal surface of which is made perfectly smooth, and in size to correspond with the external diameter of the pipe about to be made. The bore of the pipe is formed by a solid rod or mandril rigidly fixed concentrically along the inside of the die, with its free end slightly projecting therefrom so that by this means an annular passage constituting the die is formed between them, and through this passage by the working of the pump lever, the molten metal is intermittently drawn from the melting pot and forced out in the form of a tube, the metal being chilled before it issues from the mouth of the die by water, which is applied to the latter externally. The melting pot is set over the fire of a furnace, and surrounded by the flues. All the parts and details of the apparatus are made of hard metal.

This part of the invention, although only a subordinate feature of the whole, embodies the principle whereon all the subsequent inventions for making soft metal pipes in continuous lengths are based; but there is no clue to it in the title of the invention, and its existence was not discovered until after the first sheets of this series of Abridgments were printed.

[Printed, 1s. 2d. Drawings. See Repertory of Arts, vol. 9, p. 361.]

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## ERRATA.

- Page 263, line 5, for "Betwen" read "Between."  
 " 277, " 2, for "castings" read "casting."  
 " 277, " 21, omit the word "the."  
 " 279, last line, for "again and" read "and again."

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